FIBROID TUMORS OF THE UTERUS
THE C. JEFF MILLER LECTURE

A Review of 1025 Cases Treated by Hysterectomy or Radium

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THE passing on March 21, 1936, of lovable C. Jeff Miller, who
was taken sick during the last meeting of The Southeastern
Surgical Congress, precluded him, as President, from addressing
you at this hour. A ruthless cardiac accident took the most courtly
and distinguished gynecologist of the South. A man among men, of
rare charm and a finished surgeon, he was renowned alike for his
leadership and his surgeonship. As an author, he was master of a
facile, free, lucid style and he wrote from a large and winnowed
experience. The bibliography of his writings numbers six score and
more and two textbooks. His papers covered every phase of gyne-
cology and the important lesions of the abdomen. He was an inspir-
ing teacher in Tulane and in the Postgraduate School, as well, dis-
seminating his sound theories and seasoned practice among the many
who came under the magic spell of his tutelage. He died too young,
at 61, and his like will not soon be seen again.

Cast in heroic mold, he typifies the sturdiness of his Scotch for-
bears. Reared in the foothills of the Cumberland Plateau, he rode
daily from his Tennessee home up the mountain trail to the Uni-
versity of the South, book in hand; his horse needing no guidance.
Significantly he returned in 1930 to deliver the baccalaureate address
and receive the honorary degree of Doctor of Science.

Read before the Eighth Annual Assembly of The Southeastern Surgical Congress, in
Charlotte, March 8, 9 and 10, 1937.

He had the homely but shining example of a country doctor for a preceptor—Dr. Thaddeus Johnson, his maternal uncle. After graduation at the University of Tennessee and on completion of his internship, a visit to glamorous New Orleans lengthened into a lifetime of happy achievement. He lingered, attracted by the fame and erudition of Matas and by the stirring example of Ernest S. Lewis, the leading abdominal surgeon of the South, to whom he soon became chief of clinic. The ambitious young man garnered of the unrivaled experience and modesty of Lewis. Dr. Miller succeeded to the chair of gynecology upon his chief's retirement.

In his earlier work he became an accomplished obstetrician. This begets a placidity of mood. It gave him tranquillity. The happy experience of placing a precious little bud of love in a young mother's beckoning arms, after the perils of travail, gives mellowness and touches a doctor's life with ineffable tenderness.

The characterizing quality of Jeff Miller was worthiness. It was unvarying and dependable. He was unhurried.

Trying surgical experiences in their dear-bought knowledge are sanctifying. Good results quicken and bless. An evil outcome chastens and sears. It is getting wisdom with a branding iron. In him, oft-recurring surgical efforts begat a sound judgment. Seeing all sides, he envisioned the kernel of truth and would stand by to see it fructify. Mastership of technic is a gift to the diligent alone. The glory of specialization is in its heightened craftsmanship. Beauty of concept and accuracy of execution are twin gods of surgical endeavor.

Cultured, his papers and addresses were informative and engaging. In debate there was about him a coercive, persuasive blandness that caused his hearers to share his views. They were restful. There was a sonorous melody in his voice. He arrayed his facts convincingly. An unwearying gleam of truth shone through his discourse.

His colleagues freighted him with honors and called him to the presidency of all the great sectional, special and national societies to which he belonged. He was kindly, genial and dignified. Moynihan said, "Our calling by common consent, the noblest of them all, dignifies all who join its ranks."

Classmate, comrade, surgeon, friend, exemplar of all the cherished attributes, I revere you. Your genius will forever lie on the fragrant bosom of Memory.

The privilege of delivering the Inaugural C. Jeff Miller Lecture is an honor to which no one could be insensible.

My friend met me on my arrival in New Orleans at the last meeting and urged me to speak on "Surgical Consideration of Tumors of the Uterus," the subject of Dr. Erdmann, who was unavoidably absent. I at once demurred and urged Dr. Miller to fill the vacancy as it was a subject upon which he was so eminently qualified to speak with recognized authority. He still insisted that I take the subject, offering me the choice of any of his slides. I finally prevailed upon him to take it, urging that I was the presiding officer. Many of you will never forget his splendid presentation. It was his last of many memorable addresses.

To fulfil the last request he ever made of me and because the subject is one which his genius has so illumined and "that being dead he yet speaketh," I have chosen as the subject of the Memorial Lecture "Fibroid Tumors of the Uterus."

This study is based on 1025 cases of fibroid tumors of the uterus in our clinic—668 were hysterectomies and myomectomies and 357 were treated with radium (a number of them were treated by my late associate, Dr. W. O. Floyd, and by Dr. C. R. Crutchfield). Among the hysterectomies there were 21 deaths, a mortality of 3.1 per cent. Of the last 102 hysterectomies there were 3 deaths, a mortality of 2.9 per cent—one death was from peritonitis, one from obstruction, and one from brown degeneration of the heart muscle on the seventh day in a woman with a large bleeding fibroid and a symptomless goiter. Of the 357 radium cases there was one death early in our series from peritonitis from tubal inflammation, a mortality of 0.28 per cent.

Approximately 12 per cent of white women have fibroid tumors and 20 per cent of women over 35 are said to have fibroids (Graves). In negroes they are three times as frequent, but no estimate can be absolutely accurate, because 55 per cent are symptomless, according to Lockyer.

The etiology is said to be the result of endocrine imbalance or maldevelopment. Witherspoon holds that all fibroids are due to the estrogenic principle. Meyer believes that the influence of the ovarian function is purely trophic and that diminution of the blood supply (non-hormonal) results from the general atrophy of the uterus. Lynch found that 15.5 per cent of his fibroids requiring operation in a non-goiter district presented evidences of having or of having had thyroid disturbances.

Three out of four fibroids are intramural and remain so. Those that become submucous are probably the cause of the most bleeding

and often the most pain, because of nature's effort to pedunculate and finally, partially or completely, to expel them, which is sometimes successful. The older gynecologists attempted to bring this about by dilatation of the cervix with a laminaria tent. I once saw a woman who had apparently been in labor for two days. An incredibly large pedunculated fibroid filled the entire vagina. I put an ecraseur around it and removed it by this bloodless method.

The subserous variety often become pedunculated and the blood supply is so impoverished that the growth obtains its nourishment from adhesions to the omentum and viscera that sometimes look like clusters of worms. Occasionally the pedicle is practically amputated by strangulation and becomes parasitic.

There are examples of practically all of the various varieties occurring in one uterus. Technically difficult to remove are those tumors which, while not truly cervical are underneath the uterus and raise it up, together with its blood supply, so that the uterus, apparently normal in size, sits on the large tumor "as a pistol cap on a pumpkin." The reverse may be true where an enormous growth may rest above a relatively small uterus. Then there are examples of lower segment growths that have no apparent cervical pedicle and are bigger at the bottom than at the top. The peritoneum has to be circumcised and the growth mobilized to manufacture a workable pedicle.

Fibroids develop more frequently in nullipara than in multipara. Especially is this true of the smooth, nodular growths. Joseph Price used to say that smooth fibroids occurred in clean women and multinodular fibroids in association with Neisserian infection. Miller says fibroids occur more frequently in virgins and in absolutely or relatively sterile women. The incidence of fibroid being ten times in the colored race (in the South) to one in the white, and the very great frequency of inflammatory processes of the adnexa would substantiate Price's contention. He picturesquely described some of his fibroids to be as big as a beer keg.

A fibroid never results in carcinoma although a fibroid through pressure and irritation may cause carcinoma on the opposite wall of the endometrium. One of the aphorisms of Miller was, "There is never an excuse for urging women to submit to hysterectomy on the plea that her fibroid is likely to turn into cancer."

Herbert Spencer, as a result of a very careful preparation and sections of his fibroids, found sarcoma in 6.6 per cent. He also found undiagnosed carcinoma in 1 per cent of his myomas after removal.

This is more likely to occur in the intrauterine submucous growths. Such a tumor observed recently after removal was microscopically fibroid. It recurred and when removed four months afterward serial sections showed sarcoma. During its removal the uterus was accidentally perforated but closed from above as the growth was still believed to be an innocent fibroid. When sarcoma was found, radium was employed and two weeks later a vaginal hysterectomy was belatedly successful.

A tumor with a slender pedicle and the bulk high in the abdomen may become twisted on its pedicle just as an ovarian tumor, giving rise to an increase in symptoms.

Hypertrophic endometritis is the explanation for a great deal of the excessive bleeding in fibroids. Before the days of irradiation, I have on numerous occasions curetted the uterus for hemorrhage with great relief and occasional permanent cessation of hemorrhage enabling elderly patients, in whom operation was contraindicated, to carry on.

All of the large myomas that are growing rapidly should be operated on, especially if there is indication of degeneration of the fibroid. One of our patients who had a large, smooth, globular fibroid ran an unexplained fever for a number of weeks without any apparent cause. It was finally determined that the tumor should be removed. During the struggle of the first stage of anesthesia a very large quantity of foul, purulent material was expressed from the uterus by the unusual amount of contraction of the abdominal wall. When the tumor was removed, it was found that a degenerative, sloughing, central necrosis was the cause of the temperature, which promptly subsided. In another case where all arrangements had been made for a hysterectomy, an afternoon temperature of 100 was discovered and the operation postponed for two or three days, the temperature being considered transient. The temperature however continued and finally became high and the diagnosis of degeneration was made, but the patient became so septic that the operation could not be performed and the gangrenous process was mortifyingly disclosed at necropsy.

SYMPTOMS

Menorrhagia occurred in about one-third of our cases, metrorrhagia in one-fourth, and dysmenorrhea in one-half. Pain and the various pressure symptoms and degeneration were noted in a variable percentage.

One of Miller's teaching axioms was, "Menorrhagia may be due to various lesions in association with fibroids. Whatever its cause,

severe menorrhagia in women past the usual time of the menopause, she should be examined for fibroid tumor."

Fibroids cause sterility. About three times as many women who have fibroids are sterile as those who have not.

There is some associated tubo-ovarian pathology in nearly half of the larger growths in our series. This is apart from the large oyster-like ovaries that have interstitial hypertrophy and occasionally cystic degeneration, described by Virchow.

The bladder may be carried up extremely high on the anterior wall of the tumor—great care has to be exercised in its detachment. In spite of care, injuries sometimes occur, which can be recognized and repaired with regularly satisfactory results, but it is an embarrassing complication. The uterovesical pouch of peritoneum may be so distorted as to be difficult of differentiation. Division through the thin peritoneal covering only and careful sponging the bladder down with a small pencil rubber sized roll of gauze in a forceps will obviate injury except in unusual implantation.

If there is displacement of the ureter from large intraligamentous tumors or growths that are retroperitoneal, its location must be carefully ascertained. Injuries rarely occur in the hands of cautious surgeons. Immediate transplantation of the ureter in the bladder when possible is the simplest expedient. End to end anastomosis is not always possible and when performed, a stricture is prone to occur. Accidental ligations of the ureters has put the kidney out of commission by aseptic back pressure, often without the knowledge of the surgeon or the patient. After a urinary fistula, however, potential infection is so likely that one should be chary of tying the ureter in the expectation of drying up that kidney. Ureteral transplantation into the sigmoid, when possible, is preferable to nephrectomy.

The classic distinction between ovarian and fibroid tumors is sometimes not definite when the tumor is fibrocystic. Ascites, which complicates a parasitic tumor, is rare in comparison with the free fluid associated with malignant growths. Pregnancy has notoriously confounded nearly every good diagnostician and some who are not. The dilemma has been dehorned by the Aschheim-Zondek test. The soft fibroid can simulate pregnancy intra-abdominally. On one occasion I closed the abdomen over such a tumor to my great chagrin. I have had my diagnosis of fibroid challenged by a colleague, who opened the abdomen and diagnosed pregnancy; I subsequently had to remove the fibroid, much to my satisfaction. The pregnant uterus is purplish and soft; the ordinary fibroid is pink and hard. The

x-ray, after the fifth month, usually shows the fetal skeleton. This may seem a confession of lack of diagnostic confidence, but the vagaries of abdominal growths may elude the most astute clinician and all supporting evidence should be invoked.

In reference to fibroids complicated by pregnancy, Miller said: "There is rarely an excuse for doing hysterectomy in the course of a pregnancy complicated by fibroid, at least before the period of viability . . . Cesarean section in spontaneous labor is not possible, hysterectomy or myomectomy being done then, according to indication. Myomectomy is usually practical in symptoms developed during gestation. Even if the patient should avoid a miscarriage she is far better off than if the chance to complete the conception had been eliminated by hysterectomy."

Fundal tumors offer no difficulty to parturition—cervical fibroids may. Incarcerated or intraligamentous growths, on account of the danger of abortion when myomectomy is done upon a pregnant uterus, are best treated at term by cesarean section with or without myomectomy, or a Porro operation.

The occurrence of carcinoma of the left-in cervix is variously estimated. In our own cases we are aware of only six cases in 668 supravaginal hysterectomies, as most of them were.

Franckel says that the danger is no greater than in the unwounded uterus.

Teham and Amreich compute the percentage of cancer of the cervical stump that existed was observed in .68 per cent, while Herbert Spencer, a great advocate of total hysterectomy, says, "The opprobrium of gynecology is cancer of the cervix in the left-behind subtotal operation." He reports 719 cases of total hysterectomy performed by himself and two others with a mortality of 1.9 per cent. This commendably low mortality cannot be obtained by the general surgeon. He himself quotes the tabulation of Halban and Seitz, showing the mortality of total hysterectomy varied from 0 to 25.7 per cent and said that more than half of the authors had a death rate of more than 5 per cent. Lynch does panhysterectomy only when the cervix is badly diseased, but even then supravaginal hysterectomy in the poorer risks.

The whole point is whether or not the incidence of cancer in the left-in cervix is greater than the difference between the mortality in the total hysterectomies and the subtotal in average hands. A safe solution is the destruction of the cervix in parous women by cautery at the conclusion of the operation or before the patient leaves the hospital. Polak, who formerly performed total hysterectomy, later

compromised on prophylactic cauterization or irradiation. Mayo advises "cupping or coning out the cervix from above," thus removing all of the mucosa of the cervical canal. We have had no known case of carcinoma of the cervix left in after hysterectomy in the last ten years since the employment of these measures.

INDICATIONS FOR RADIUM

When the tumor is under the size of a four months' pregnancy, particularly if associated with bleeding, and when the patient is over 37 years of age, if there are no complications, especially of an inflammatory type, radium is indicated. In poor risk cases of cardiovascular disease, in obese women, in those with severe anemia, and where recurrent severe bleeding occurs after myomectomy, radium is advised. But after the menopause if there occurs bleeding, not referable to the cervix, surgery is preferable to radium because of the likelihood of cancer of the body of the uterus.

In cases of large fibroid tumors of the uterus where the general condition, such as cardiac, nephritic, and circulatory lesions, precludes operation, the bleeding can be stopped by irradiation in many cases. This is useful in very fat women. It is wise, however, to curet the uterus for biopsy, if possible, before either radium or x-ray. Bleeding cases that are extremely anemic can be greatly benefited by curettage and radium. If the tumor is too big to expect permanent cure by irradiation of the ovaries because the fibroid does not allow the radium to get close enough to the ovaries, it is a good preparatory treatment and subsequent operation can be successfully done.

Where radium was chosen to cure the patient, a few cases have had to be reoperated upon—so far as known, 6 out of 357 in our series. Two were doctors' wives and feared cancer. We operated on them successfully, but only on the insistence of the doctor husband. Two who had the nervous symptoms of artificial menopause were operated upon elsewhere against our advice; two others for unchecked growths.

Of eighty cases studied by Stacy at the Mayo Clinic, five who had had radium had subsequent operation.

Corscaden said about results of radium, "Of the cases followed, a reduction in the size of the fibromyomata occurred in 96 per cent of the cases—55.2 per cent with complete disappearance, 28.3 per cent with a reduction of 50 per cent or more, and 12.5 per cent were definite but unimportant reduction. The larger tumors have responded less satisfactorily than the smaller."

Surgery and irradiation as methods in the treatment of fibroid should not be competitive but rather complementary. There are sharp indications for operation and contraindications. The same may be said of radiation, and that method is best which fulfills most accurately the needs of the individual patient.

Quoting Miller: "The mere existence of a fibroid does not mean that any treatment at all is necessary, let alone hysterectomy; a symptomless fibroid discovered accidentally needs routine observation but it does not need surgery."

Surgery is indicated:

1. When infection of the adnexa exists; in multiple fibroid larger than a 3 or 3½ months pregnancy; in tumors that are impacted in the pelvis; when submucous fibroids protrude from the cervix; in tumors causing bladder disturbances and pressure symptoms; in those undergoing degenerative changes; in indigent and working women; when the anemia is more grave than could be caused by the amount of bleeding.

2. In all tumors associated with pain, torsion or the degenerations, i. e., necrosis.

3. In incarcerated tumors.

4. Where the tumor has recently grown rapidly, probably from degeneration, whether benign or malignant.

5. Where pelvic pain is an outstanding symptom. Inflammatory lesions of the tubes and ovaries so often occur in the larger fibroids (in approximately one-fourth of the cases) that they must not be ignored. Moreover, the pain may be due to an endometrial cyst of the ovary, etc.

6. A history of insanity precludes irradiation as castration sometimes precipitates hereditary taint into an acute mental aberration.

7. In younger women and especially where matrimony or children are desired.

8. Where definite diagnosis is not certain.

9. After the menopause, radium is a very dangerous measure on account of the danger of the development of fundal malignancy. According to Miller, surgery is better.

10. In pedunculated tumors, whether under the peritoneum or under the mucous membrane.

11. When patients have an unchangeable, although misguided, fear of radium, it is better not to employ it as many conditions may be erroneously ascribed to it.

The operative risk perhaps has reached an irreducible minimum in the hands of many excellent surgeons. It is nevertheless true that there is a certain inevitable mortality. "Hysterectomy is a successful operation only when it is performed upon the proper indication," wrote Miller, who also said: "It is being resorted to when simpler, safer procedures would appear equally good results without its inevitable risks and . . . The minimum mortality of any operation mounts to maximum heights in the hands of the careless and untrained man." In the average hospital it (the mortality) is never under 5 or 6 per cent and it may run to 8 or 10 per cent. In the Clinic of the University of Pennsylvania, one of the best organized in the country, they reported 681 cases with a mortality of 1.46 per cent—518 were uncomplicated, the mortality was .39 per cent. In 163 complicated cases the mortality was 4.9 per cent, more than twelve times as high. "Your imagination and mine," says Miller in the incomparable Hodgen Lecture, "can supply the mortality which the average surgeon would have achieved in circumstances in which one of the most skillful surgical teams in the world could not avoid a death-rate of nearly 5 per cent." The lurking dangers of surgery should not be substituted for the slight risk, if any, that a patient takes with a small, symptomless fibroid. The Four Horsemen of Death after hysterectomy are shock from hemorrhage, thrombus, intestinal obstruction, and peritonitis. In the Nashville General Hospital in a series of 276 cases reported by Dixon, the mortality in 210 supravaginal hysterectomies was 7.1 per cent, whereas in 20 total hysterectomies it was 15 per cent. This series presented all the complications and defects of the indigent. The medical mortality among 61 women not operated upon was 3.2 per cent. Burch in a series of 200 consecutive hysterectomies, in which there were five supravaginal to one total, reports a mortality of 4.2 per cent. Petersen 4.5 per cent. Grad performed 180 hysterectomies in private cases with a mortality of 1.1 per cent and in 66 ward cases, 3.3 per cent. There were four supravaginal to one total.

The great *bête noire* of the surgeon is that terrific catastrophe, cardiac or pulmonary embolus, which comes like a bolt from the blue. It is often after all the usual hazards of operation are past and sometimes when the patient is up and about to leave the hospital. Many methods have been utilized for its prevention, such as thyroid extract and the early and frequent movement of the limbs, avoidance of large transfixion areas, but it still has not been eliminated.

Myomectomy vs. Hysterectomy

"The young woman who has a single tumor or even several tumors but who desires the preservation of function should be treated

by myomectomy; under such circumstances hysterectomy is a surgical crime." (Miller.)

Hysterectomized women are indubitably prone at times to develop an inferiority complex with an unhappy result. This is especially true of a nulliparous woman. There is a feminine aversion to being made wombless. Hysterectomy where myomectomy is at all feasible may, in the words of Bonney, one of myomectomy's greatest proponents, make the surgeon "the executioner of, who knows, how many secret hopes and tender fancies."

He reported 77 married women within the child-bearing age at the time of myomectomy and wishful to conceive, had produced 36 live children and 39 per cent of the whole number conceived. He extends the operation to very considerable lengths and reports having removed from 15 to 20 and up to 125 separate nodules at one sitting and only 8 out of 210 patients developed new fibroids after the operation. In 403 cases of myomectomy the death rate was 1.7 per cent. Of the children 75 per cent were born naturally.

TECHNIC

The ingenious technic devised by Bonney and his followers includes: (a) hemostasis by myomectomy clamp, similar to a metal tourniquet. In the absence of this, a long, soft, slender bowel clamp may be placed on the broad ligament occluding the ovarian uterine arteries. (b) A long, bold, free anterior incision into the uterine cavity, which allows ready enucleation. (c) The avoidance of mattress sutures on account of the danger of vascular necrosis. (d) The employment of the Reverdin needle for interrupted sutures of catgut. (e) The employment of the hood operation for large tumors on the posterior wall, bringing the cowl over and suturing it anteriorly to prevent adhesions. (f) A special ingenious type of operation for cervical fibroids. (g) The block excision with the use of the ring compression (sponge) forceps for the ovarian artery, making a bloodless operation.

HYSTERECTOMY

The last of Miller's gospels is contained in one line:

"Hysterectomy is the most abused operation in gynecology."

I see so many normal appearing uteri in the laboratory, probably the seat of myopathies, and I have so small need for hysterectomy in other than fibroids that I prefer to list the operation as 'fibroid hysterectomy.'

The pioneer operators transfixed the cervix, amputated the uterus supravaginally, dropped the ligatures and brought them out in the lower angle of the wound.

Thomas Addis Emmett, whose last house-surgeon at the Woman's Hospital I happened to be, was the first to utilize the peritoneum anterior to the uterus to cover the cervical stump in a hysterectomy (1884). Dr. Lewis A. Stimson, the hem of whose garment I was privileged to touch as an intern at the old New York Hospital House of Relief, was the first to practice systematic ligation of the ovarian and uterine trunks as a cardinal principle in hysterectomy (1889).

The first operation I saw for fibroid was performed in the early nineties by my father. He used the extraperitoneal treatment of the stump with metal skewers thrust through the cervical pedicle and hemostasis obtained by a piano wire ligature underneath the skewers—Koeberle's *serre-noeud*. He was the first American surgeon to do a successful hysteromyomectomy (1862). Joseph Price brought that method to a very high degree of technical perfection. It was a very safe operation, but was only adapted to tumors with a long and narrow cervical pedicle and was often followed by hernia.

The first intraperitoneal treatment of the stump I witnessed was in 1897, my first year of practice, when Howard Kelley operated in my father's clinic and I was privileged to assist him. It was the incision from left to right between clamps and across the cervix. I was fortunate enough to relieve the patient of postoperative obstruction from velamentous adhesions on the sixth day by secondary operation.

Of the many changing and varied technical steps which have made hysterectomy such a perfected operation at the present time are spinal anesthesia, the Trendelenburg position, the self-retaining retractor of Balfour, the free exposure of the uterine vessels before they are cut and tied, and the utilization of the round ligament to the cervical stump to peritonealize the bottom of the pelvis when possible. Hysterectomy can be woefully complicated by inadequate exposure.

The skillful, conscientious surgeon is he who, in the ripeness of his unerring judgment, knows when to stay his hand as well as to employ operation in the technically brilliant and sound manner of that master-surgeon, C. Jeff Miller.

ENDOMETRIOSIS OF THE UMBILICUS

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T UMOROUS formations at the umbilicus are rather frequent in women. However, malignant growths per se, whether primary or secondary, are rare. Occasionally, tumors at this site present a diagnostic problem to the pathologist, who, by an incorrect interpretation, may cause considerable anxiety. Ectopic endometrial foci may be mistaken for adenocarcinoma.

Endometriosis is the term applied to endometrium-like tissues, occurring outside of the uterus and tubes (endometriosis externa). These foci respond to the menstrual stimulus by menstrual bleeding. The subject of endometriosis has been clarified mainly by Cullen.[1]

These formations have been found along the course of the round ligament, most often near the external ring; in the utero-ovarian and uterosacral ligaments; in the ovary; in the sigmoid, cecum and appendix; in the pelvic lymphnodes; in the wall of the urinary bladder; in the perineum; as implantations in the abdominal scar after cesarean section and other operations on the uterus and tubes; and as tumors of the umbilicus.

The present report deals with an umbilical tumor which clinically was thought to be a urachus cyst.

Mrs. E. L., aged 37 years, married 13 years, had one child 11 years old, she had had no abortions or miscarriages. Menses had been regular and painless. She was admitted to this hospital May 23, 1937, complaining of a mass over the navel. The clinical diagnosis had been urachus cyst.

Eight months prior to admission the patient had become aware of a small hard lump, the size of her little finger (4 mm. in diameter) in the lower part of the umbilicus. This progressively increased in size, and became more painful with successive menstrual periods. The pain was described as being intense and burning in character, beginning the day of onset of menstruation and continuing for 7 to 10 days. Also at this time the umbilical tumor was moderately tender. The patient was not certain whether the mass enlarged or changed in color during menstruation.

Examination: A hard, uniform, roughly rounded mass 16 mm. in diameter adjoined the lower half of the umbilicus in the midline. It was immobile, and not tender on pressure. The overlying skin appeared ordinary.

Surgical Specimen: Gross examination: The specimen consisted of the neoplasm and the umbilicus. The bisected tumor was 21 mm. in thickness. The entire cut surface presented numerous miliary cystic spaces measuring from 0.3 mm. to 3.5 mm. in diameter. Some were filled with fresh blood, some with blood clot and others with brownish grumous material. The intervening tissue was fibrous in character and in areas discolored by blood pigment.

Microscopic Examination: The dermis and epidermis appeared ordinary. Throughout the subcutis there were irregularly disposed islets of variable size and shape, more or less resembling uterine mucosa. These consisted of solitary glands and aggregates of ordinary, enlarged, deformed and cystic glands of the uterine type, embedded in more or less typical endometrial stroma. The more typical glands were lined by ciliated columnar epithelium. The cysts varied in size and shape and some presented intracystic papillary formations. The lining epithelium was flattened, atrophic or absent in areas. Some cysts showed recent hemorrhage, others contained hemolysed blood, blood pigment, and macrophages filled with hemosiderin and iron-free pigment. A few of the cysts were broken down and partly overgrown by granulation tissue.

The endometrial stroma was markedly cellular and in areas edematous. In the cystic foci it showed fibrous connective tissue overgrowth and dense infiltrations of lymphocytes. Sections stained by Weigert's acid iron chloride hematoxylin and Van Gieson's picrofuchsin, and with the buffered Romanowsky stain (Lillie and Pasternack[2]) failed to disclose the presence of smooth muscle in these areas. Free and phagocytosed blood pigment was present in the endometrial and subcutaneous connective tissue. The specimen did not include fascia and muscle. The tumor was neither circumscribed nor encapsulated.

DISCUSSION

These tumors are usually encountered in women of child-bearing age. They are rarely large, they "menstruate" and may be the source of blood-stained discharge at the umbilicus. The prevailing symptom is pain at the site of the tumor during the menstrual period. The treatment consists in the excision of the navel and tumor.

Although over seventy cases of endometriosis of the umbilicus have been reported, its infrequency is emphatically demonstrated in Strongin's[3] report. He found endometriosis of the umbilicus only three times in a study of 37,355 gynecologic cases (the largest series on record).

The origin of these growths has caused considerable speculation, and many hypotheses have been advanced to explain their genesis. The advocates of the theories of origin that require implantation or metastasis of fragments of endometrium are more or less baffled in explaining its occurrence at the umbilicus. The proponents of the embryonal anlage and of serosal metaplasia, offer a more reasonable explanation for its origin in this location.

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A FURTHER DISCUSSION OF THE SUPRAUMBILICAL TRANSVERSE INCISION

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Memphis

IN December, 1935, I made a preliminary report of 77 upper abdominal operations performed through the transverse incision. That report was read before the Southern Surgical Association and published in Annals of Surgery in July, 1936. A similar paper was read before the Second Congress of the Pan-Pacific Surgical Association, Honolulu, in August, 1936, and published in the Proceedings of that Congress. The number of operations in which the supraumbilical transverse opening has been employed has now reached 134, which is sufficient to justify definite conclusions in regard to its advantages. In this paper, therefore, my simplified technic will be described again and my experience with the procedure to the present time reported, with particular reference to (1) preservation of the structures of the abdominal wall and their functions, (2) avoidance of the danger of weakening the wall, wound disruption, and hernia, (3) reduction of postoperative pain, and (4) prevention of disabling adhesions.

For almost 40 years surgeons in Europe and America have sought an approach to the abdomen which would fulfil the requirements of the ideal incision by conforming to the above principles. The first three depend primarily upon the conservation of the nerve supply, and it is in this feature that the chief merit of the transverse incision lies. It parallels the course of the nerves and follows the lines of the fascial fibers, extending forward and inward, thus causing the least possible injury to these vital structures. Its direction, moreover, precludes the formation of distressing adhesions. Vertical incision, on the other hand, necessarily cuts one or more of the nerve trunks, often causing excessive pain, producing atrophy and weakening of the muscles, and tending to bring about the very consequences which surgeons have endeavored to prevent.

Noteworthy technics for incising the upper abdomen have been presented in Europe by Sprengel, Perthes, Bakes, Koenig, and others, and in America by C. U. Collins, Souther, McArthur, Moschcowitz, Quain, Sloan, Mason, Singleton, the Bartletts, and Schwyzer. Among these incisions was one curved to correspond to the contour of the costal arch, a transverse combined with a curved or oblique, and a transverse with one or more in a longitudinal line.

In several of the incisions, a part of the layers of the wall were divided in one direction and the remaining layers in another.

Moschcowitz and Quain, following Sprengel and Bakes, cut straight through the wall, partially or completely severing the rectus muscles. Tate Mason brought out a wound having a right angle. The Bartletts have devised a "staggered" type of incision. C. U. Collins, Souther, McArthur, and Schwyzer, each have advocated a
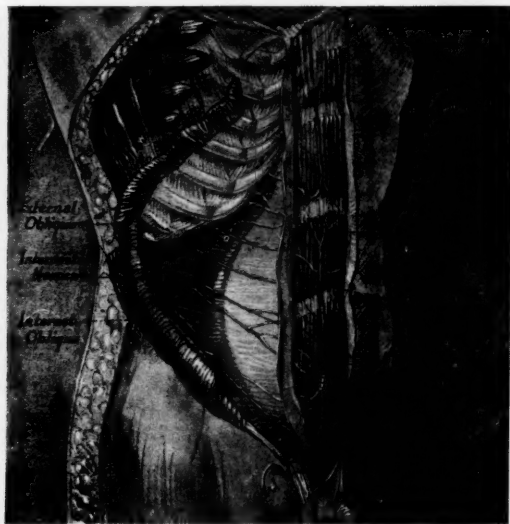

Fig. 1. Anatomic drawing showing the position of nerves and blood vessels in the abdominal wall.
Reprinted from Dr. A. O. Singleton's original article in THE SOUTHERN SURGEON 3: 235 (Sept.) 1934.

vertical opening of the superficial structures and a transverse incision of the posterior sheath and peritoneum and, if necessary, division of the linea alba. Sloan made a median vertical opening to the fascia, then dissected the skin and fat widely and divided the anterior sheaths of the recti by a vertical paramedian incision. After retracting the muscles laterally, he incised the posterior structures in a transverse direction. By the Singleton procedure, the skin and fat are opened transversely and dissected widely from the anterior sheaths up and down, especially on the right. The anterior sheath over the right rectus muscle is then incised vertically and the muscle is retracted. The anterior sheath of the left rectus is split transversely for a short distance to afford ample retraction of the muscle, and the posterior wall is divided across.

I was impelled to try the transverse method because of dissatis-faction with the number of wound disruptions, impaired abdominal walls, postoperative hernias, and adhesions, as well as with the num-ber of cases in which pain was excessive following operation through the vertical opening. In my first experience, the Sloan and Single-ton incisions were used. However, the technic of both these was involved, surgery was extensive, and the space created by the wide dissection of the superficial structures invited infection.
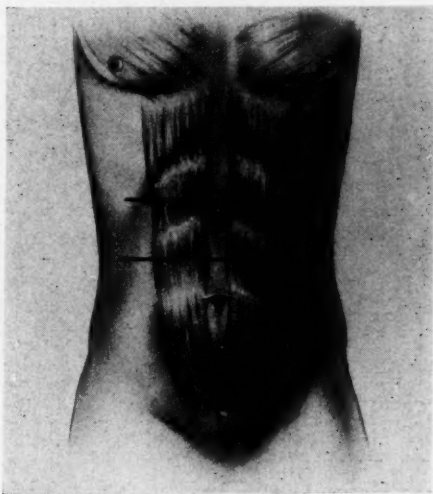

Fig. 2. Showing that the incision may be made at various levels, according to the width of the costal angle.

In an attempt to obviate these dangers and difficulties, I devised a simple and adequate opening, one which I consider ideal in that it preserves so far as possible the integrity of the wall structures. A description of the technic follows:

For cosmetic effect, the skin incision is made for an equal distance on both sides of the midline. To permit ample view of the operative field, it should extend practically from one costal margin to the other. The exact site will be determined largely by the width of the costal angle: the wider the angle, the higher above the umbilicus should the incision be placed. In the average patient, the juncture of the middle and lower thirds of the distance between the xiphoid and umbilicus and between two of the lineae transversae is the most suitable location. For operations on the biliary tract, the subcu-taneous structures should be incised farther to the right than to

the left of the midline. The opening is carried down to the anterior
sheaths of the rectus muscles. No dissection of fat and superficial
tissues is made longitudinally, as simple retraction of the wound
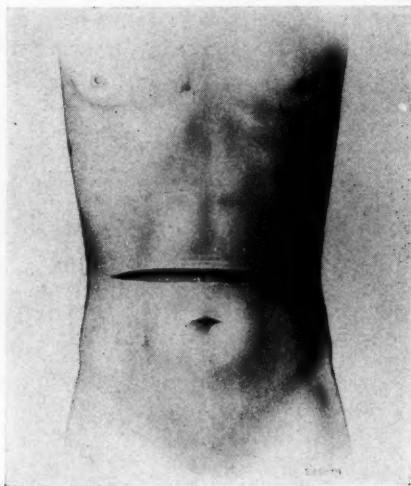will expose the anterior sheaths. These are then divided in line with
their fibers.

Fig. 3. Showing transverse incision down to anterior rectus sheaths. For operations on
the biliary tract, it is slightly longer to the right of the midline. For splenec-
tomy, extension should be to the left.

The next step is the most tedious and difficult part of the technic.
Since the recti are densely adherent anteriorly to the sheaths, espe-
cially at the lineae transversae, one must elevate the sheaths care-
fully and, with scissors, dissect the muscles free for a distance of two
or three inches up and down. Extreme caution must be exercised in
liberating the sheaths from the lineae transversae, otherwise, the
muscles may be weakened and their fibers more easily torn by
retraction. On the posterior side of the muscles the sheaths adhere
only slightly and may be freed with ease.

The recti are now retracted laterally and the opening is contin-
ued transversely through the linea alba and posterior sheaths and
peritoneum. The falciform ligament is divided between clamps, the
ends ligated and dropped back. With adequate retractors, the
wound is opened wide for exploration or operative procedure.

For the purpose of clarity, in the artist's illustrations, Figs. 4 to 9
inclusive, the linea alba is shown split into definite layers continuous
with the anterior and posterior sheaths of the recti. In reality, the
sheaths are split on the two sides of the linea alba, but no effort is

made to divide the linea alba into anterior and posterior layers; it is simply cut across and retracted with the sheaths.

Drainage tubes may be brought out through the right angle of the wound lateral to the rectus muscle. This affords a more direct and even more dependent drainage than is obtainable through the vertical incision.
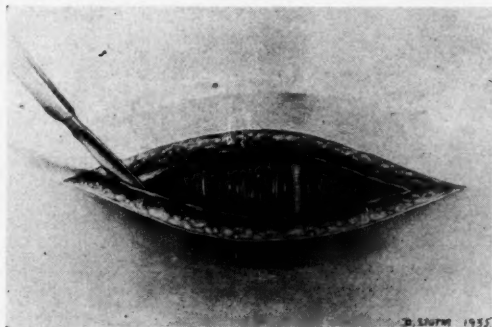

Fig. 4. Showing the incision extended through the anterior sheaths of the recti on both sides of the linea alba. In reality, the linea alba is not split into definite layers, as is shown here.

The wound is now closed in layers, as any other type of abdominal incision. Suturing is more readily accomplished if begun on the left.

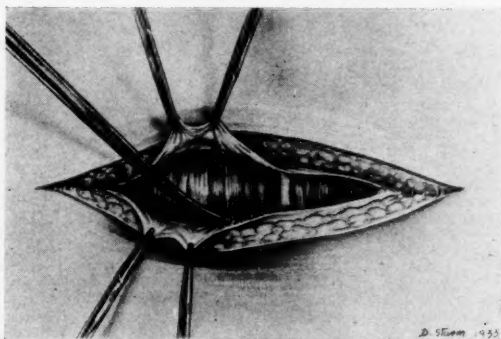Fig. 5. Showing separation of anterior sheaths above and below from their attachments to the muscles.

The peritoneum and posterior sheaths, being adherent, are closed together. The divided ends of the falciform ligament are approximated by inclosure in the suture. Even though the patient is straining, there is no tension on the wound and its edges are easily drawn together. The rectus muscles are then brought to their normal po-

sitions and the anterior sheaths are closed. When the operation is complete, three interrupted sutures of chromic catgut are placed in the linea alba as an additional measure of safety. Retention sutures are unnecessary, but may be used if desired.
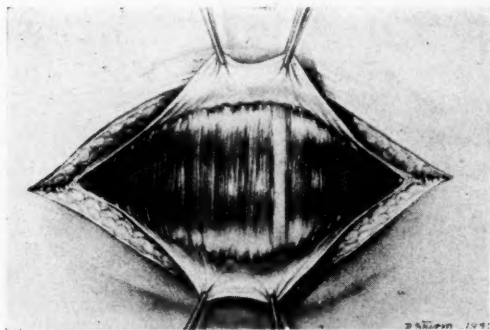

Fig. 6. Showing separation of the sheaths and muscles completed, ready for lateral retraction of the muscles.

In a few instances I have removed the gallbladder without severing the linea alba or prolonging the opening to the left side, as has been suggested by Schwyzer. If the operation is to be a high stomach
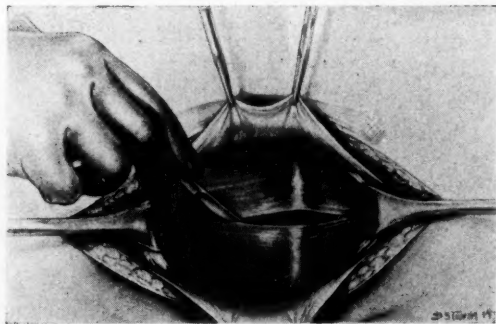
Fig. 7. Showing recti retracted wider to right. The aponeurotic fibers of the posterior sheaths are being separated and the linea alba divided.

resection, an extension may be made to the left. Also, the incision may be lengthened in one direction or another in an approach to the kidneys or spleen. It is feasible in a number of cases to remove both the gallbladder and appendix through the one opening; however, when cholecystectomy and appendectomy are to be performed at the same time, I prefer to remove the appendix through a separate incision unless it is easily accessible.

It has been argued that retraction of the rectus muscles sufficiently to permit exposure may cause hemorrhage, damage to the nerve supply, rupture of the muscle fibers, and consequent weakening of the wall. The untoward events are possibilities, but are by no
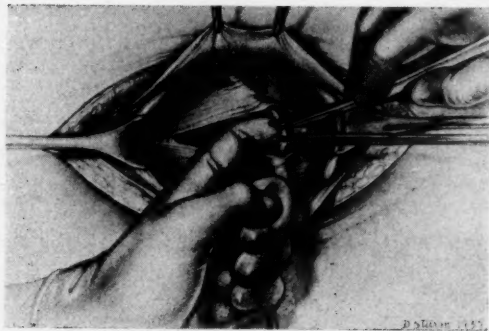
Fig. 8. Showing peritoneum open and falciform ligament being divided between clamps.

means certainties; with the exercise of proper care and skill in manipulation, the important function of the muscles should remain unaltered.
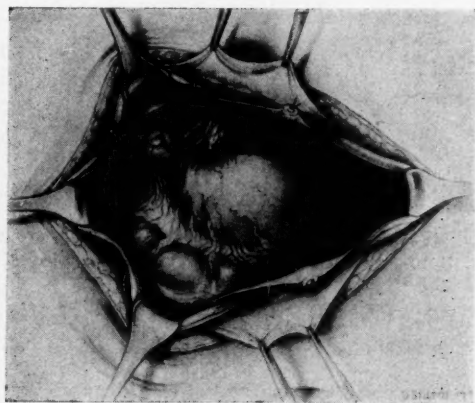
Fig. 9. Showing stumps of falciform ligament ligated. Wound widely separated by retractors. Liver margin, gallbladder, stomach, duodenum, and transverse colon easily exposed.

I have not adopted this method exclusively, however. A vertical incision is still employed in patients who have an extremely narrow arch, or in those who have previously had an operation through a vertical opening, by which the nerve trunks have already been divided. With these exceptions, the transverse incision may be em-

ployed successfully in persons of every type. In thin patients, one simply places the line at a lower level, so the costal arch will not interfere with surgical performance. Fortunately, the procedure is most applicable where most needed. Many patients who require
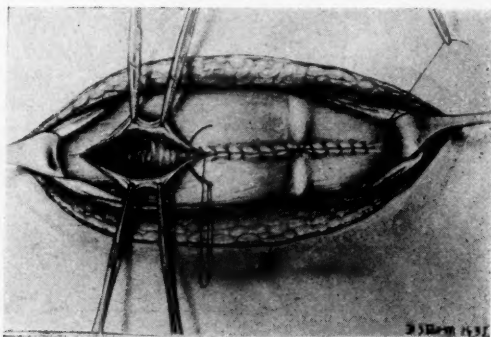
Fig. 10. Showing closure of peritoneum and posterior sheaths from left to right, without tension. Muscle still retracted.

upper abdominal operations are large, obese, and beyond middle age, with abdominal walls composed chiefly of fat and thinned out, flabby muscles and fascia. The peritoneum and posterior sheaths are especially thin and friable, making adequate closure of that layer
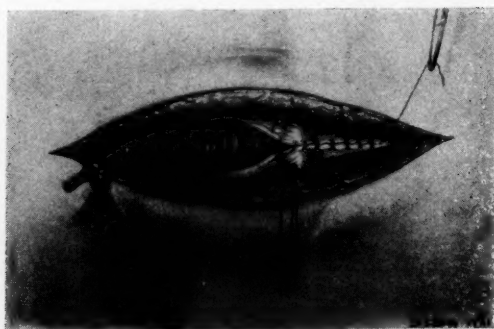
Fig. 11. Showing recti replaced and anterior sheaths being sutured. Drain tube lateral to right rectus.

difficult and uncertain. The omentum is thick, and, in many cases, the peritoneal cavity seems too full of viscera. As these patients usually take the anesthetic poorly, respiratory effort is increased, which is a further hindrance to proper suture. From the standpoint of facility in opening and closing, the incision presented here is particularly advantageous in this group. Further, it tends to obviate

disruption of the wound, which not infrequently is a formidable complication in these cases.

The 134 operations in which I have employed the transverse incision have consisted of the following: cholecystectomy, 54; cholecystostomy, 1; cholecystostomy and subsequent cholecystecto-
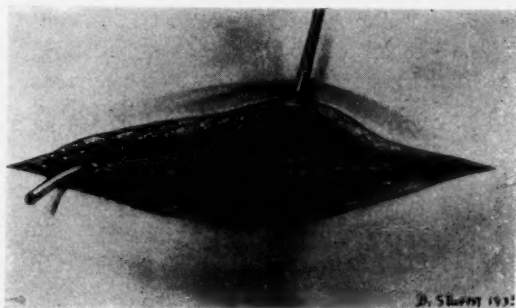
Fig. 12. Showing fascial suture complete. Three interrupted chromic catgut sutures through linea alba.

my, 1; cholecystogastrostomy, 5; partial gastrectomy, 3; gastro-enterostomy, 4; pyloroplasty, 2; duodenoplasty, 2; exploration, 9; drainage liver abscesses, 3; splenectomy, 3; and 47 combinations of two or more operations on the gallbladder, ducts, stomach, duo-
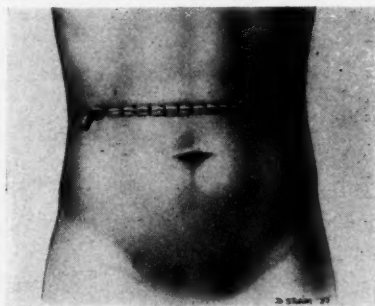
Fig. 13. Showing operation complete. Skin closed with interrupted suture. Drain through right angle.

denum, intestine, colon, appendix, spleen, and liberations of adhesions, drainages of liver abscesses, and explorations. In 14 of these 47 cases a McBurney incision was made in addition to the transverse opening. The appendix was removed through the transverse incision in 13 cases. Sloan's technic was used in 26, Singleton's in 17, Schwyzer's in 1, and my own in 90.

In one case secondary closure was necessary because of infection which prevented prompt healing. In another an abscess formed in the incision, probably from unabsorbed knots of catgut suture; after curettage, no further difficulty was encountered. In a third case a pocket of serum formed beneath the superficial tissues following cholecystogastrostomy; pyloric obstruction supervened before healing was complete and required reopening of the incision and posterior gastroenterostomy. A fourth patient, on whom a cholecystogastrostomy had been performed, had a hemorrhage from the wound. Transfusions and intravenous medication were ineffectual. The wound was reopened for control of the hemorrhage and healed uneventfully thereafter. Postoperative hernia developed in only one case. The operation was excision of an ulcer high on the lesser curvature of the stomach. Both rectus muscles were severed because of the inaccessibility of the lesion. Infection arose in the wound and was responsible for the hernia. Repair was subsequently made through the same incision.

In my experience, this new and simpler procedure has proved advantageous from the surgeon's viewpoint in that it affords ample room and freedom of movement, as well as an excellent view of the operative field. From the patient's viewpoint, it has been uniformly gratifying in that shock, pain, and distention are appreciably reduced and respiratory distress is much less acute. It has been found that only half the amount of opiates is necessary for the relief of suffering as is required for those who have had a vertical incision. Convalescence is shorter, and patients may be permitted to sit up two to four days earlier without fear of damage to the wound. Healing takes place readily, recovery is hastened, and the cosmetic result is excellent. Moreover, the superficial structures are not widely dissected and there is no tendency to the accumulation of serum or the development of infection from this source; the formation of dangerous adhesions is unlikely; more efficient drainage is possible, and the wound edges are approximated naturally; and, finally, the nerve and blood supply are preserved by the longitudinal separation of the tissue fibers, trauma is reduced, the integrity of the wall is maintained, and the danger of wound disruption and postoperative hernia is greatly minimized.

In view of these advantages, the transverse incision would seem to deserve more extensive use in properly selected cases. Performance of this, as of any new technic, is naturally a little tedious in the beginning, but it is my belief that every surgeon who practices the method until a proper skill is acquired will, in common with those mentioned herein, accord the incision his generous approval.

THE DIAGNOSIS AND TREATMENT OF MALIGNANT TUMORS OF THE BREAST

J. Shelton Horsley, M. D.

Richmond

IN 1934 there were 13,171 deaths from cancer of the breast in the United States, as compared with 10,912 in 1930.

In cancer of the breast there is far more opportunity for making an early diagnosis than in cancer of the stomach, and the excuse of ignorance of the presence of a lesion is usually lacking. The slogan that "every woman with a lump in her breast should have an immediate diagnosis" is excellent. If there is delay disaster may follow. In cancer of the breast as in other diseases the earlier the diagnosis is made the more difficult it is, but at the same time the more important it is for cure.

The classic symptoms and signs of cancer of the breast recorded in the textbooks are frequently of the terminal stages of the disease. When the growth becomes ulcerated and fixed to the skin and chest, and when there are palpable glands in the axilla and the supreclavicular space, the diagnosis is obvious, but the prognosis, unfortunately, is also obvious.

Frequently a careful examination will detect the nature of a breast tumor even in an early stage. A small scirrhus, with its slight contraction of the nipple or tugging on the skin, may sometimes be demonstrated by examining the patient in the supine position and then sitting up in different postures. To be sure, the two breasts are not usually perfectly similar in outline and consistency, and these natural differences must be considered. It is highly important to handle breast tissue gently. The age of the patient also has much to do with the diagnosis. Multiple tumors in a woman under 30 years of age are, in the great majority of cases, benign. The mobility of the encapsulated growth is a test of its nature. Cancer of the breast in the early stages is practically always painless, but not infrequently a benign tumor will produce pain and tenderness, particularly during the menstrual period.

The influence of the ovarian secretion on tumors of the breast has been emphasized in recent years. Lewis and Geschickter[1] have written interestingly upon this subject, and seem to have shown that at least some of the benign tumors may be the product of ovarian secretion (estrin). That benign tumors occasionally become malignant is well known. If cancer arises from a benign tumor caused by

an excessive secretion from the ovary, estrin may be at least the indirect cause of cancer of the breast.

Too frequently benign tumors of the breast have been treated solely locally, when a careful pelvic examination will disclose an enlarged hypertrophied ovary which is prolapsed and tender. A partial excision of such an ovary, as in partial thyroidectomy for hyperthyroidism, may relieve the mammary symptoms of the patient and prevent recurrence of the tumor after excision when other measures have failed. According to Simpson[2], Lacassagne has produced cancer in male mice by the injection of estrin over a long period of time. Bragg has shown that the stagnation of milk in the mammary glands of female mice greatly increases the incidence of cancer.

The transillumination of the breast is helpful in the diagnosis of tumors in certain instances, but does not show a small growth in the margin of the breast, and should be construed along with the other symptoms. Adair[3] says, "My feeling at present, however, is that the value of this transillumination test is overemphasized. Too frequently the inference is left that one can make a diagnosis of cancer by transillumination. This cannot be done."

A. C. Scott of Temple, Texas, proposed examining the breast in early suspected cancer cases in a dark room with illumination from a flashlight thrown obliquely on the breast in such a way that the folds or depressions of the skin that could not be seen in direct light will be brought out.

Enlargement of the lymph nodes in the axilla may be due to metastases from cancer, but when cancer is present even without ulceration enlarged lymph nodes may be only hyperplastic and contain no cancer. On section a soft node with brownish color is quite different from a cancerous node.

The vagaries of cancer of the breast should be borne in mind. I have recently had a patient with markedly enlarged lymph nodes in the left axilla, not very firm, and movable. Blood examination showed no apparent blood dyscrasia, and there were no demonstrably involved lymph nodes elsewhere. A careful examination by myself and others could demonstrate no lesion in the mammary gland. The nipple was normal. However, as the lymph nodes were suggestive of malignancy, a biopsy was done, and frozen section showed cancer, apparently metastatic from the breast. A radical operation on the breast was immediately done and after numerous sections of the mammary gland a small infiltrating mass about 0.5 cm. in diameter was discovered near the central portion of the mammary gland. Section of this tissue showed cancer of the same histologic appearance as the nodes of the axilla.

Of course this is an exception. Usually the original growth increases and supplies metastases as it becomes larger, but the fact that the reverse may be true should be borne in mind in cancer of the breast, for this is also occasionally found in cancer of other organs. Not infrequently there may be extensive metastases in the liver from a small malignant lesion in the stomach or colon.

TABLE I
January 1, 1922, to January 1, 1932

107 Cases of cancer of the breast.
    4 Nonoperative cases.
  103 Operative cases. (No operative mortality.)
        1 Insertion of radium (palliative).
        6 Palliative excisions.
        1 Excision of sarcoma. Patient now living and well.
     89 Radical operations.
           12 died from other causes.
           30 living and well.
           46 died from recurrence.
            1 living with recurrence.
    6 Volkmann amputations.
            2 died from other causes (grade 2 and 3).
            2 living (grade 1).
            2 died from recurrence (grade 2 and 2-plus).

When patients with a lesion in the breast complain of recent pain in the back, shoulder or arms, it may be an ominous symptom. These patients should have a thorough x-ray examination of the bones to determine if there are metastases in the spine. Occasionally a rather small lesion in the breast will give metastases in the spine, and here, of course, removal of the original growth is futile.

There may be benign lesions that closely simulate cancer. Fat necrosis of the breast, as described by Lee and Adair[4], may occur as an infiltrating mass with retraction of the nipple and pigskin appearance of the skin. These cases, however, usually give a history of a trauma. Biopsy readily clears the diagnosis.

TREATMENT

The treatment of cancer of the breast may be divided into those cases that should be treated by irradiation alone, and those that should be operated upon with or without irradiation. Those that should be treated by irradiation alone include cancer of the breast in all women under 30 years of age. Personally, I do not know a woman under 30 years of age who has survived operation for carcinoma of the breast by a period of five years. While in cancer of

the stomach age makes but little difference in the prognosis after operation, cancer of the breast seems to be peculiarly fatal in women under 30 when operated upon. No matter what the stage of the disease, if a definite diagnosis of cancer of the breast is made in a woman under 30, I believe it would be best to refer her to a competent roentgenologist for permanent treatment. It is all the more important, therefore, that a correct diagnosis of tumors of the breast be made in younger women and with increasing experience we are more careful and often less positive in making a diagnosis of benign tumors in these patients. I can see no point in giving a suspicious growth extensive x-ray treatment. If it is benign, it can be easily removed, and if it is malignant a biopsy is usually necessary to determine the diagnosis, but this is all that should be done surgically.

TABLE II

96 Operative cases (excluding palliative operations).

    14 Died from other causes

        5 had preoperative x-ray treatment.
        9 had no preoperative x-ray treatment.

   82 Other patients.

     33 Living and well.

        8 had preoperative x-ray treatment.
      25 had no preoperative x-ray treatment.

     1 Living with recurrence.

        1 had preoperative x-ray treatment.

    48 Died from recurrence.

      26 had preoperative x-ray treatment.
      22 had no preoperative x-ray treatment.

In advanced cancers when the breast adheres to the chest, or when numerous lymph nodes are enlarged in the supraclavicular and in the axillary spaces, the treatment should be solely irradiation. Occasionally if there is a fungous mass with a foul odor, the breast may be removed merely as a palliative measure, but even in such a case intelligently applied roentgenologic treatment will often afford more relief than palliative surgery. An incomplete operation for cancer, if the section is made through cancerous tissue, actually stimulates the growth, particularly if there has been no x-ray treatment previously.

Cancer en cuirasse or with skin involvement outside of the mammary gland, with the orange skin or pigskin appearance and red,

erysipelas-like spread of the growth, should be treated solely by irradiation. This type of cancer tends to spread in a radiating manner in the subcutaneous fat and fascia such as Sampson Handley described many years ago, and beyond the apparent limits of the growth cancer cells are lodged. They are fairly superficial and irradiation is particularly effective. Occasionally after a series of treatments the growth recedes and disappears entirely, or a residual small mass may be left in the breast. When this lump persists after efficient treatment by irradiation, operation may then be indicated.

TABLE III

82 Patients operated upon for cancer of the breast between Jan. 1, 1922, and

Jan. 1, 1932 (excluding patients who have died from other causes).

33 Living and well (40.24 per cent).

10 Grade 3 or 3 plus in malignancy.
22 Less than grade 3.
1 Sarcoma, not graded.

1 Living with recurrence. Grade 2.
48 Died from recurrence.

32 Grade 3 or 3 plus in malignancy.
16 Less than grade 3.

Still another class of mammary cancers that should be treated solely by irradiation is cancer developing during pregnancy. Such cancers grow rapidly in the vascular breast tissue of pregnancy, and operation is almost never successful. If irradiation causes a regression of the cancer and the patient survives the pregnancy, operation may then be considered.

The roentgenologic treatment should be done by a competent radiologist with a modern equipment. An incomplete or unsatisfactory treatment in the early stages may very seriously impair treatment later on.

In cases in which the diagnosis of cancer seems fairly obvious, it has been my practice for a good many years to advise a heavy x-ray treatment of two or three erythema doses (1000 to 2000 R) over the affected breast and its immediate tissues one or two days before the operation. This treatment has been given by Dr. Fred M. Hodges or his associates. Dr. Hodges now believes that the recent improvement in roentgenologic technic has been so great that the treatment given five years ago or longer probably has not been beneficial. A report of our cases seems to confirm his opinion, though he has given much benefit by roentgenologic irradiation to many of the type of cases referred to above as inoperable.

Dr. Hodges now suggests that the patient be given several heavy treatments over a period of three days before operation, and we shall adopt this plan in the future. The idea of leaving a patient for a month or six weeks with a cancer of the breast while mild doses of irradiation are given does not seem rational. During this time the deep cells that probably are not reached or certainly are not ma-

TABLE IV

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1 Sarcoma, not graded.
6 Grade 1 malignancy.

    1 died from other causes.
    5 living and well.

1 Grade 1-plus malignancy. Patient living and well.
13 Grade 2 malignancy.

    2 died from other causes.
    6 living and well.
    1 living with recurrence.
    4 died from recurrence.

24 Grade 2-plus malignancy.

    2 died from other causes.
    10 living and well.
    12 died from recurrence.

29 Grade 3 malignancy.

    5 died from other causes.
    9 living and well.
    15 died from recurrence.

10 Grade 3-plus malignancy.

    1 living and well.
    9 died from recurrence.

12 Grade 4 malignancy.

    4 died from other causes.
    8 died from recurrence.

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terially affected by the comparatively mild doses that must be given over this long period may propagate and produce distant metastases, whereas with very heavy doses given for just a few days before operation the deeper cells are doubtless affected by the irradiation and there is probably not sufficient time for distant metastases to take place. The deeper cancer cells that remain after a radical operation when so treated may be deleteriously affected, which could not be attained under milder doses extending over a longer period of time, and the superficial cells should be destroyed.

It seems logical, then, to have a preoperative course of irradiation in all cases of cancer of the breast in which the diagnosis is defi-

nitely made, extending over a brief period before a radical operation is done.

Postoperative irradiation as a routine measure is of doubtful efficacy. If properly given it is to some extent deleterious to the health of the patient, and it is like shooting in the dark. However, when there is a sign of local recurrence or when the axillary glands are extensively involved, postoperative irradiation especially over the supraclavicular region is indicated.

TABLE V

48 Cases with axillary gland involvement.

    9 died from other causes.
   34 died from recurrence.
    5 living and well.

48 Cases with no axillary gland involvement.

    5 died from other causes.
   14 died from recurrence.
    1 living with recurrence.
   28 living and well.

The percentage of recurrent cancer when the axillary lymph nodes were involved seems high. In many of these cases, however, the involvement was extensive. In 3 cases it was necessary to resect the axillary vein, and 89.7 per cent of all patients with cancer of the breast admitted during this decade were operated upon for cure. Yet almost all of these patients had a few years of comfort after the operation.

For the operation itself we have been following the principles of the Rodman technic. In the Rodman technic an incision is made from the clavicle to the base of the axilla. The pectoral muscles are divided, and the axillary contents are dissected out from above downward. Great care is taken to clean the axillary vein just beneath the clavicle and to leave the intercostal muscles bare, removing all of the fat and fascia, which should be dissected free rather close to the skin. It is in this tissue that the radiating metastases occur, and if the dissection is sufficiently wide and kept close to the skin there is no need of making an extensive sacrifice of the skin itself. Then follows removal of all the tissues from above downward, including the axillary contents, the breast and both pectoral muscles, the sur-rounding fat and fascia, a portion of the serratus magnus muscle and a portion of the anterior sheath of the recti muscles of the abdomen, and the tissues around the xiphoid cartilage. Metastases to the liver frequently go in the tissues around the ensiform process.

With such an incision and dissection usually the raw surface can be covered with the skin. It may be under considerable tension. It is important to bring up the first flap of the skin over the axilla so it will be snugly approximated to the axilla. At other points the general principles of plastic surgery are employed. Closure is effected with interrupted and continuous sutures of silkworm gut. Numerous stab wounds are made with a sharp-pointed knife not only at points of tension but in the flap for some distance from the obvious tension. This undoubtedly aids in preserving the vitality of the skin. A stab wound is made in the outer flap and a medium size soft rubber drainage tube is inserted and fastened with a silkworm gut suture. This tends to drain off the lymphatic exudate that otherwise might remain and contain some cancer cells.

TABLE VI

33 Patients living and well (40.24%).
15 over 9 years after operation,
(8 from 10 to 13½ years).
18 over 5 years.

The points we particularly emphasize in this operation are the clean dissection of the axilla from above downward, removing all of the fascia and fat at the apex of the axilla beneath the clavicle, the frequent flushing out of the wound with salt solution, the wide excision of the subcutaneous fat and fascia in the block dissection, the covering of the wound with the skin, and drainage. Another point that seems important is doing the operation in a comparatively short time. Most of these operations can be completed within an hour and a half, and many in less time than that, without sacrificing the merits of the dissection. If we must carefully clamp every small vessel and lose practically no blood, it is impossible to do this operation in less than three and a half to four hours, but by beginning the operation with intravenous 5 per cent dextrose in Ringer's solution shock can be largely avoided. Without this the loss of blood is frequently accompanied by shock which may be serious, but by the continuous intravenous injection of dextrose in Ringer's solution during the operation and for several hours afterward, keeping the blood pressure up, shock is almost always prevented or greatly modified. If much blood is lost a transfusion of blood can be given.

In a long continued operation during the manipulation cancer cells are more likely to be forced into the lymphatics, even when the manipulation is gentle, than by a quicker operation in which gentle

handling of the tissue is also employed. Of course nothing in the technic of a careful block dissection of the tissue should be sacrificed.

RESULTS

Our cases reported here were operated upon over a period of ten years, between Jan. 1, 1922, and Jan. 1, 1932. There are 107 cases in all, including 4 in which no operation was done, and 7 in which there was only a palliative operation. In 7 cases only a simple mastectomy with excision of the pectoral fascia (Volkmann operation) was done because of the apparently low grade of malignancy. There was no operative mortality. This decade was selected because it would give a minimum period of five years' observation and because it contained most of the cases in which a single heavy roentgenologic treatment was given within forty-eight hours before operation. All of the patients in this list have been traced and accounted for.

It is obvious that if a series of mild cancers of the breast, such as the comedo-cancer, was reported the eventual percentage of cures would be very high, whereas with the more virulent type of cancer even with the most radical operation the percentage of cures will be low. It must be recalled, however, that an extensive invasion by a low grade cancer is probably more difficult to cure than an early lesion of a very malignant cancer. Ten cases are reported as cured that had cancerous lesions that were graded 3 in malignancy, while in most of the recurrent cases the lesion was of high virulence. All of those in grade 4 have died. The fact that some of the cured cases were of fairly high virulence shows that other things are important to the prognosis besides the grading of the cancer itself. There are no comedo-cancers in the group reported. I have personally examined the slides of all of these cases recently except in one case, whose slides and specimen are lost. This woman died of recurrence. The operative notes showed axillary metastases and frozen section showed high grade of malignancy.

It is difficult to harmonize a pathologic and a clinical classification of cancers of the breast. The comedo-cancer type of cancer is, usually, comparatively mild. The medullary, or rapidly-growing, cancer is classed as grade 3 or 4. The obvious adenocarcinomatous growth in which acini can be demonstrated, and the scirrhus, which is doubtless a later stage of some other form, are other types. I have not attempted to classify them very rigidly, merely noting the milder types as fairly well differentiated adenocarcinoma, from the more virulent types.

The average age of the patients in this series was 53 years. The youngest patient was 28 years of age, and the oldest was 78.

Adair reports in operable cases of cancer of the breast at the Memorial Hospital Clinic in New York City the five year cures average 40.6 per cent.

In the following statistics our five year cures are 33, or 40.24 per cent. These do not include operations which are considered to be palliative in which an infected fungating breast was removed without radical operation merely to give the patient relief or in which the patient's general condition apparently contraindicated a radical operation. It will be noted, too, that the percentage of cases which had preoperative heavy x-ray treatment within 48 hours before the operation shows a somewhat higher percentage of recurrences than those that did not have this treatment. This is at least partly explained by the fact that the heavy preoperative x-ray treatment was only given in those patients in whom the diagnosis of cancer was obvious, and consequently the cancer was fairly well advanced. In patients in whom there was reasonable doubt about the diagnosis and in whom a biopsy had to be performed with immediate operation because the growth proved to be cancer, no preoperative x-ray treatment was given because if the growth was benign the x-ray treatment would cause a burn and serious damage to the breast. Consequently, those without preoperative x-ray treatment were mostly early cases.

Of this total number of 107 cases, 4 were not operated upon, 7 received only a palliative operation, 7 because of the apparent low grade of malignancy or the condition of the patient had a Volkmann operation for cure, and 89 were operated upon radically. This gives a total of 96, or 89.7 per cent of operations for cure of all patients with malignant tumors of the breast admitted to St. Elizabeth's Hospital during the decade from Jan. 1, 1922, to Jan. 1, 1932.

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INDICATIONS AND CONTRAINDICATIONS FOR SPLENECTOMY

A Review of Cases Observed in the Clinic of the College of Medicine of the Ohio State University

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I N discussing this subject I shall review the work of Doan, Wiseman and Curtis in the clinic of the College of Medicine of the Ohio State University and add some additional data in support of their published arguments for the performance of splenectomy in certain clinical conditions even at times when prevailing opinions have been definitely against surgical interference; also restate the scientific basis for their position and from the logical deductions therefrom, explain their departures from some of the accepted pre-operative procedures.

The spleen is one of those enigmatic organs of the body, which, while apparently yielding freely its secrets of structure, both gross and microscopic, its readily recognizable activities and functions, has, as it were, been holding back some hidden qualities having powerful influences on the maintenance of health, or, conversely, actually capable of producing serious marked disturbances.

Probably the main reason for our failure to learn more of these activities in certain blood dyscrasias, is the fact that we do not find such dyscrasias in animals, and in our failure as yet to produce them experimentally.

While we owe much of our knowledge of the anatomy and physiology of the spleen to animal studies, it is perforce normal anatomy and normal physiology. However, by careful clinical observations, studies of the blood by the latest developments in technic, examination of material obtained by biopsy, by major surgery and by the autopsy very definite and suggestive data have been accumulated.

I need not discuss the gross or microscopic anatomy nor dilate upon the generally accepted physiology. Since Barcroft's work the spleen has been regarded as a reservoir of red blood cells through which the cell volume of the blood is kept in a state of equilibrium. It enlarges during body rest to accommodate the excess of red cells, while in periods of activity it contracts to discharge the increased

number of cells needed to carry oxygen to the tissues during muscular exercise.

It acts somewhat as a blood filter and especially as a graveyard for blood cells; it preserves the iron and pigment of the red cells, and it may be that in the breaking up of these latter there is set free some chemical stimulant of fresh red cell production, just as Doan found the nucleinate bodies from his study of the rhythmic rise of young leukocytes following the ebb of the older forms.

The attention of Doan and Wiseman has been particularly directed in the last few years to the excessive destructive action of the spleen in certain blood dyscrasias, especially as this phenomenon is noted in hemolytic icterus. This disease is rather casually discussed in most textbooks as of rather infrequent occurrence, usually familial; the result of an inherited weakness of the erythrocytes, and also as an acquired condition secondary to some acute infection or other unknown factor.

Under prognosis, to quote from Krumbhaar[1]: "The danger to life is slight except in the exacerbations of severe cases. In most cases, however, the damage to health is considerable." Further, under treatment, he says, "Splenectomy has proved almost without exception, a practical cure. With the improvement in the recognition of the disease and its operative treatment, the mortality has now fallen to below 3 per cent. Even this low death rate should suffice however to prevent surgical interference if the patient suffers little or no inconvenience. Splenectomy should practically never be performed during an exacerbation."

The experience of Doan and Wiseman[2] would challenge this casual attitude. In the past 5 years in a city of approximately 300,000 and adjacent territory they have found 17 active cases. That it is more prevalent than realized, is suggested by the fact that of these 17 families studied, only one had been recognized as harboring this familial trait before coming under their observation.

Further, the question of its being an acquired condition, or the occurrence of sporadic cases is open to doubt. Certainly the family history should be carefully investigated and several other relatives should be tested before such a conclusion is even tentatively reached. Many cases at first thought sporadic have proven on such investigation to be familial.

In regard to the possible developments in any case of hemolytic icterus, a certain analogy may be drawn to patients having had one or two attacks of appendicitis, or with a recognized so-called chronic appendicitis. If such individuals are to be within easy reach of a

good hospital with competent surgical facilities, if they know of their own condition and their medical attendant is likewise advised, and there is no great interference with their health, operation may be held more or less in abeyance, although there is a definite hazard incurred.

On the other hand, should they contemplate a long trip, perhaps into foreign or strange countries, or live where prompt and efficient surgical attention would not be available, or if the health is definitely impaired, the hazard is greatly increased and prophylactic appendectomy is much more strongly indicated.

In our experience the patient with hemolytic jaundice is in a somewhat similar position, and with as great or even greater potentialities of disaster.

In milder cases with a full understanding of their condition, with access to proper surgical facilities, the question of operation may be kept in the background. On the other hand, if, as Krumbhaar has stated, "In most cases, however, the damage to health is considerable", why should surgical intervention be delayed, particularly as in all such there is the potential threat of a crisis with serious danger to life?

Furthermore, many intercurrent conditions seriously impair the health or life expectancy of these individuals. I could anticipate only a fatal outcome in pneumonia for instance, and I shall give case histories of the effects of bone fracture and gall stone occlusion of the common duct. I would not wish to give the impression of advising splenectomy in every case of hemolytic icterus, but rather a wider appreciation on the part of the clinician, the surgeon and the patient of the hazards to life and health, the value of prophylactic surgery under proper indications and the need of prompt emergency surgery in crises.

It is for this last that I make the most earnest plea. It is in this condition that the workers in our clinic offer their main challenge to the generally accepted dictum of non-interference.

From his studies of the blood in this and other diseases, C. A. Doan of our Department of Medicine 5 years ago became convinced that the spleen was the motivating factor in the production of the crisis of hemolytic jaundice; that the case against the spleen being definitely proven, the scientific sentence, in the absence of any other successful treatment, could only be splenectomy. With this conviction in mind and with the courage of their conviction, Doan and Wiseman, with the surgical collaboration of George Curtis of our Department of Research Surgery have advised and carried out splenectomy when distinct evidence of health impairment was pres-

ent, when signs of moderate crises indicated danger of severe crises or when finally the patient was in the midst of severe crises, even almost moribund, with the most gratifying results.

The number of splenectomies performed in our clinic in this study to date is 31. Of these, 17 were for hemolytic icterus without a single fatality although 6 were in acute crisis and 2 had less than 2 Gm. of hemoglobin and appeared practically moribund when taken to the operating room. For a more detailed discussion of these cases with complete case histories, I will refer you to Doan's article and to his Beaumont Foundation Lectures in Detroit in 1936.

I would like, however, to mention some outstanding points of interest in 3 cases.

CASE 1. This woman of 50 years gave a history of a moderate degree of anemia with suggestive icteric color of 25 years' duration. She fell from a stepladder and fractured the tibia of one leg. The local reaction was severe, edema, pain, etc., but no marked general crisis. After 4 months there was no good union and after a careful study of the blood splenectomy was advised and performed. The blood response was immediate and the local condition was showing good progress and the patient was able to get about with a Thomas splint.

While still thus handicapped she caught her heel on a step and fell fracturing the tibia and femur of the other leg. The contrast in the local reaction following this second and more severe trauma was very marked and callus formation progressed normally with good union; at the present time she is in better health than for many years.

CASE 2. This was one of our earlier cases, a child 4 years old who had been treated intensively by liver therapy after very casual blood examination. The child grew steadily worse, consultation was asked of our clinic and the diagnosis of severe hemolytic icterus established. Testing members of the family showed stigmas of the same condition in the mother and maternal grandfather. Splenectomy was advised and refused. She was given 200 c.c. of paternal blood and a slight and temporary rise of red blood cells resulted—a second of the same amount was given with the same result, but 12 hours after this second transfusion the count sank to 800,000 cells and clinically the child appeared moribund.

In desperation the parents consented to operation and at midnight an emergency splenectomy was performed. The effect upon the blood was dramatic. One year later the blood and general health of the child were essentially normal.

From this and later experience it is felt in our clinic that blood transfusions in the crises of hemolytic icterus are not only not helpful but definitely contraindicated.

CASE 3. I mention this case to illustrate one of the hazards of chronic hemolytic icterus even of moderate intensity. H. L. S., a mail carrier 50 years of age, was brought to the University Hospital from Akron, Ohio, on Dec. 4, 1933, by ambulance. From boyhood he had known of his sallow skin, easy fatiguability and a mass in the upper left abdominal quadrant. In 1919, a

diagnosis of "congenital splenic anemia" was made at Lakeside Hospital, Cleveland.

On Nov. 29, 1933, while delivering mail he was seized with an attack of pain correctly diagnosed as gallstone colic. Severe jaundice and prostration developed. The attending physician, Dr. Paul R. Adams, was aware of the enlarged spleen and former diagnosis of splenic anemia, and he sent the patient to our clinic. Examination developed an icterus of double origin, and a question of procedure developed. The great height of the icterus index, the highest ever met in our clinic, together with the danger of the trauma of an impacted stone causing a blood crisis, indicated the immediate relief of the cholemia. A cholecystostomy was therefore performed under local anesthesia supplemented by nitrous oxide.

Prompt evidence of the lessening of jaundice appeared and the icterus index dropped in 48 hours from 850 to 94, but in 36 hours the erythrocytes dropped a million cells and continued to fall to a low of 1,600,000 with signs of an acute crisis with a probable fatal outcome. He was given 5 Gm. of calcium chloride in 200 c.c. of normal saline intravenously, and 1500 c.c. of Ringer's solution with 5 per cent dextrose by hypodermoclysis and splenectomy performed 58 hours after the cholecystostomy. Again the blood response was dramatic. In January, 1934, a cholecystenterostomy was done and after a stormy convalescence from many complications he recovered and by June 1, 1934, had resumed his occupation.

The following month he brought his son to the clinic for examination and the evidence of the same inherited condition being found, he requested a prophylactic splenectomy, which was successfully done July 12. At that time the father showed a red blood count of 4,850,000 with a normal picture and a body weight gain of 40 pounds and corresponding evidences of improved health.

Inasmuch as patients with hemolytic jaundice show a very greatly increased tendency to pigment calculi, the increased hazard to such patients of this danger of an induced crisis from trauma from impaction should be borne in mind.

Banti's Disease: Four cases with this condition were operated upon. Two were early cases and the results have been satisfactory to date. What the ultimate outcome will be is open to speculation, but their progress is being kept under careful observation.

The other two cases were well advanced with evident hepatic cirrhosis; operation was done because of the very serious hemorrhages from esophageal varices, and it was hoped that splenectomy might cause a re-routing of the blood and lessen the esophageal vein congestion. Both patients succumbed to the operation, in spite of copious blood transfusions.

Thrombopenic Purpura: Three cases are included in this series. All were operated upon on the theory that in each there was a sequestration of the platelets in the spleen after thorough and meticulous laboratory examination. In our clinic it is felt that if such a condition is established, splenectomy should be done, even in acute crisis, provided that adequate preoperative transfusions are given. The preoperative measures in such cases are in sharp contrast to

those with hemolytic jaundice. The beneficial results may be just as dramatic.

Hypoplastic Anemia: With the belief that there is an abnormal inhibitory action of the spleen on the bone marrow in hypoplastic anemia, three cases of this clinical syndrome have been subjected to splenectomy. After 3, 2 and 1½ years, respectively, the clinical progress of all has been very gratifying. The time elapsed, however, has been too short to draw more definite conclusions.

Lymphatic Leukemia: One case. The patient has shown some improvement and is living and in better general health 3 years after operation. The blood picture still shows excessive lymphocytes, and the patient is being kept under careful observation.

Polycythemia Vera: One case. In this condition it is felt in our clinic that splenectomy is definitely contraindicated. In this case, however, there were such severe hemorrhages from esophageal varices that it was hoped that splenectomy might relieve the esophageal congestion for a time so as to allow for opportunity for other methods of treatment. Sixty days after the operation, however, she died of an acute polycythemic exacerbation.

Myeloid Leukemia: One case. The patient came to the clinic because of mass in left abdomen. After two years' treatment with x-ray the blood picture showed great improvement but the spleen did not lessen in size, but on the contrary appeared larger. Intestinal obstruction occurred and emergency relief was demanded. The spleen was removed for this reason only, and temporary relief followed, but the patient died sixty days later a leukemic death.

It is our belief that splenectomy is contraindicated in this disease.

Leukanemia: One case. This is a disputed term, but this patient presented both the blood evidences of myeloid leukemia and pernicious anemia. Under prolonged x-ray and intensive liver therapy he improved materially and the anemia became the dominant picture. Splenectomy was performed and he was definitely benefited to all appearances for two years when he died with pneumonia.

Conclusions

The conclusions drawn by our clinic from this series are:

1. The pathologic physiology of the spleen may be manifest through either or both of two mechanisms (a) inhibitory, (b) destructive—and may affect any or all of the circulating blood elements.

2. The spleen is the major pathologic agent in congenital hemolytic jaundice.

3. Splenectomy is indicated as a prophylactic measure against

clinical exacerbations of excessive hemolytic activity in the chronic and subacute manifestations of the disease.

4. Splenectomy is also the therapeutic procedure of choice in acute hemoclastic crises, whether the crisis is of spontaneous or of precipitated origin, and regardless of the severity of the anemia.

5. The immediacy of the erythrocyte response following splenectomy in hemolytic jaundice is dramatic, occurring on the operating table. It is usually a million or more cells per cubic millimeter in quantity and represents a true increase in total available circulating units. This autotransfusion removes the necessity for preoperative or postoperative transfusions.

6. Splenectomy is not contraindicated in properly selected cases of thrombopenic purpura in acute crisis, provided adequate preoperative blood transfusions are given. The immediacy of the beginning recovery and reappearance of blood platelets in the circulation following splenectomy in thrombopenic purpura may be quite as dramatic as the changes noted in hemolytic jaundice.

7. The responses recorded following splenectomy in this series are not the result of the operative or anesthetic influences per se, since the same studies in a series of miscellaneous operations performed under identical conditions did not yield similar results. More impressive still, three major operative procedures other than splenectomy were performed either before or after splenectomy in two patients with hemolytic jaundice, and the cellular responses were quite unlike.

8. In Banti's disease early splenectomy offers some hopes of life prolongation at least. Further observations are necessary before definite conclusions may be drawn.

9. In hypoplastic anemia theoretically splenectomy should be of value. Further study is necessary in this condition also with follow-up observations on those already operated upon.

10. In lymphatic leukemia splenectomy may prolong life, but cannot be considered curative.

11. In myeloid leukemia and polycythemia vera the operation is contraindicated.

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THE SURGICAL TREATMENT OF PEPTIC ULCERATION

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THE efficacy of surgical therapeutic measures is necessarily dependent upon a rational consideration of all factors having a pathogenic significance. The more obvious pathologic lesion may be only one consequent manifestation of the less apparent physiologic alterations in the disease process. Surgical intervention can in many instances achieve immediate and permanent relief of symptoms if intelligently directed, and this is possible only if there is a thorough and basic comprehension of the etiologic agents, their resultant disturbances in physiology, and the latter's pathologic consequences. There is no other disease for which there could be greater appositeness of these statements than peptic ulceration.

The profound and voluminous literature accumulated in a relatively short period of time is clearly indicative of the existing confusion and perplexity concerning the etiology and pathogenesis of peptic ulcer. It would be inopportune to attempt here a detailed review of this phase of the subject which may be readily obtained by referring to the excellent surveys of Hurst,[1] Halparin[2], Smithies[3], Held and Goldbloom[4], Raine[5], Carnot and Gaehlinger[6], and Martin[7]. This presentation will be confined to a discussion of the surgical therapeusis as based upon our experimental investigations and clinical observations.

As a result of the perennial clinical and experimental investigations, certain factors have been demonstrated to be of indubitable significance in the development of peptic ulceration. But of all these numerous and varied pathogenic factors it is our firm conviction that the most preeminent roles are played by "tissue susceptibility", "constitutional predisposition", hypersecretion and hyperacidity, focal infection and gastric trauma. Further analysis of these factors reveals the fact that there is one distinctive quality which classifies them into two separate groups. This discriminative characteristic is one of inherence. "Tissue susceptibility" and "constitutional predisposition" are inherent, innate factors which we have termed uncontrollable because of the obvious futility of influencing them[8]. On the other hand, hypersecretion and hyperacidity, focal infection and gastric trauma are factors which can be controlled. It is perfectly

apparent, then, that therapy must be correspondingly directed along those lines which affect this latter group. Failure of appreciation of these important underlying factors which can be influenced by therapy and the correction of which may result in amelioration of symptoms and possibly a cure has in the majority of instances accounted for the failures in the treatment of peptic ulceration.

The etiologic significance of the acid gastric juice has long been known and can no longer be denied. The strictly limited localization of the occurrence of ulcer with striking uniformity only in those areas which are habitually bathed in acid chyme and in other parts of the intestinal tract only under those exceptional circumstances which permit exposure to the gastric secretions cannot be regarded as wholly coincidental. This chemical factor has been repeatedly shown not only clinically to be of greatest significance, but has also been corroborated experimentally.

Peptic ulcer can be produced relatively easily in experimental animals. The dog is particularly applicable to the study of ulceration because it so rarely occurs normally in this animal (Ivy[9], Mann[10], and Turck[11]). The multifarious and diversified procedures employed in these investigations form an engrossing study in ingenuity, although the underlying principle has been the same, one which, in the main, consists of effecting constant contact of acid gastric chyme with de-alkalinized intestinal mucosa or mucosa unaccustomed to receiving this secretion.

Several years after the turn of the present century, Watts and Sowers[12] observed perforating jejunal ulcer opposite the stoma of a gastro-jejunostomy performed in a dog and attributed its occurrence to the hyperacid gastric juice emptying directly into the jejunum. In 1914, Langenskiöld[13] published the results of his experimental investigations which eventually led to the more consistent procedure of Mann and Williamson[14]. By eliminating completely the duodenum and shunting its alkaline secretions into the terminal ileum instead of the distal jejunum, Mann and Williamson, in 1923, so modified Langenskiöld's operation that they were able consistently to produce chronic ulcers in the dog. The results obtained by this "surgical duodenal drainage" operation have been corroborated by many others (Morton[15], Gallagher and Palmer[16] and Weiss and Gurriaran[17]), and clearly indicate the significance of the chemical factor of relative hyperacidity or improper acid neutralization by the alkaline duodenal secretions. Matthews and Dragstedt[18] further emphasized the importance of this chemical factor by showing that not only is the jejunal mucosa unable to receive this relatively hyperacid gastric chyme, but that there is a commensurate increase in this

susceptibility to ulceration with the aboral distance from the pylorus. This "tissue susceptibility", by which is meant the vulnerability of certain portions of the gastrointestinal tract to peptic ulceration, namely, the lesser curvature of the stomach, the "Magenstrasse", the duodenal cap, the jejunum, and other portions of the intestinal tract subjected to acid gastric secretions, has been repeatedly demonstrated both clinically and experimentally.

In the experimental surgical laboratory, by variously modifying the normal physiology of the gastroduodenojejunal segments we have been able to produce acute and chronic peptic ulcer in the experimental animal. Gage, Ochsner and Hosoi[19] observed that the acid gastric chyme, if allowed to come in contact with the unprotected intestinal mucosa, will produce peptic ulceration. In one group of experiments pouches were formed from the lesser and greater gastric curvatures, respectively, and later anastomosed to the jejunal loop. Whereas ulcers occurred in 71 per cent of the former; i. e., the lesser curvature gastric pouch-jejunal anastomosis series, in the latter group with the greater curvature pouch and jejunal anastomoses, ulcers of the jejunum developed in 100 per cent. The higher incidence of ulceration in the latter group is strongly suggestive of the effect of the higher acidity in the fundic portion of the stomach. Similar procedures were performed in another group of animals, with the addition of deviation of the entire biliary secretions into the curvature pouches. The occurrence of peptic ulcer in the anastomosed jejunum immediately dropped to 50 per cent in the lesser curvature experiments and 28 per cent in the greater curvature group. This illustrates the important protective influence of the neutralizing factor of an alkaline duodenal secretion.

Graves[20] further emphasized the importance of this factor by modifying McCann's experiment which in turn was a modification of the "duodenal drainage operation". McCann[21] obtained a high incidence of ulcers by deviating the alkaline duodenal secretions into the fundus of the stomach and contended that mechanical trauma was more important than peptic digestion. Graves[20], in our laboratory, modified McCann's technic so that the alkaline duodenal secretions were emptied in the prepyloric segment and obtained no ulcers; demonstrating that trauma was not as significant as the acidity factor. Presumably the explanation for the difference in results is the more efficient neutralization of the gastric juice in the latter procedure. DeBakey[22] has also demonstrated the effect of acid gastric chyme in the production of peptic ulcer and the relative protective value of the alkaline duodenal secretion. Von Haberer[23], Clairmont[24], Lewisohn[25] and others have shown that the pylorus

occlusion operation, as suggested by von Eiselsberg, results in a high
incidence of jejunal ulcer in a non-obstructed stomach. DeBakey[22]
performed first a typical von Eiselsberg operation; i. e., pyloric occlu-
sion and gastrojejunostomy, and observed the occurrence of jejunal
ulceration in 50 per cent of the animals. Later the same operation
was performed, but with the deviation of both pancreatic and
biliary secretions by anastomosing the common and pancreatic ducts
to the terminal ileum. Jejunal ulcers developed in 100 per cent of
these animals. The susceptibility of the jejunal mucosa to peptic
digestion is shown by the results obtained in DeBakey's first group
of experiments, as following the pyloric occlusion operation alone
ulcers in the jejunum developed in 50 per cent of animals. The
protective influence of the alkaline bile and pancreatic juice is readily
illustrated by the latter group of experiments, in which the incidence
of chronic jejunal ulcers increased to 100 per cent when the already
susceptible jejunal mucosa was deprived of these acid neutralizing
secretions. All of the above experiments dramatically reveal not
only the vulnerability of the jejunal mucosa to acid gastric chyme,
but also the important protective action of an alkaline medium
(pancreaticobiliary duodenal secretion).

The above factors are common to both the experimental animal
and the human. The one factor that is inherent only in the human,
and is of greatest significance, is the "constitutional predisposition"
to ulceration, the nature of which is indefinable. However, it may
be dependent upon the peculiar arrangement of the capillaries of the
mucosa of the stomach with the production of large submucous
plexuses in the subepithelial layer (vasoneurotic diatheses), as dem-
onstrated by Duschl[26], and Mueller and Heimberger[27], or of in-
creased irritability of the parasympathetic nerves (vagotonia), as
suggested by von Bergmann[28], or of overactivity of the sympathet-
ico-adrenal system, as proposed by Crile[29].

Much has been written concerning this "constitutional predispo-
sition" to peptic ulceration and its investigation has been approached
from various angles. Draper, Dunn, and Seegal[30] designate this
factor as "ulcer constitution" because they believe these individuals
have characteristic anthropometric relations. Hurst[31] believes that
the essential predisposing factor in the production of duodenal ulcer
is the presence in an individual of a hypersthenic gastric diathesis,
which manifests itself in hypertonus and hyperchlorhydria. Cush-
ing[32] has directed attention to the association of vertebral lesions
and peptic ulceration, and suggests that highly strung individuals
inclined to nervous instability, classified as parasympathetic (vago-
tonia), are particularly prone to chronic digestive disturbances with
hyperacidity, often leading to ulceration. It is not difficult to con-

ceive that as a result of the constitutional neuromuscular imbalance, the vagotonia of Bergmann, or sympathetico-adrenal hyperirritability of Crile there occurs spasm or lack of relaxation of the pyloric sphincter, with resultant gastric retention, hypersecretion and hyperacidity.

It will be readily understood that these two predisposing factors, "tissue susceptibility" and "constitutional predisposition", are inherent qualities in an individual and nothing can be done to alter the condition. However, their concomitant presence does not necessarily mean that this individual will develop ulcer. In all probability, most patients with both of these predisposing factors will have no peptic ulceration unless there is an addition of certain exciting or precipitating factors. These precipitating factors which are controllable and therefore amenable to therapy are hypersecretion, hyperacidity, focal infection, and gastric trauma. Although their presence, either collectively or individually, is responsible for the development of peptic ulceration in a patient with "constitutional predisposition", they are of no significance in the individual with no "ulcer diathesis". This is accounted for by the fact that the individual not possessing "constitutional predisposition" cannot be thrown out of physiologic balance by these precipitating factors. On the other hand, the individual having, in addition to "tissue susceptibility" or "constitutional predisposition", is constantly in a precarious physiologic balance which may be readily thrown into imbalance, with consequent development of peptic ulceration, by the slight addition of these precipitating factors.

Of all these precipitating factors, which are controllable and therefore amenable to therapy, none is of greater significance than hypersecretion and hyperacidity. The importance of gastric acidity has already been signaled in the foregoing discussion of the experimental investigations. Our clinical observations have further emphasized the preeminence of this factor.

From the foregoing discussion, it can readily be seen that the factors which seem to have pathogenic significance in the development of peptic ulcer are divisible into two groups. The first group consists of uncontrollable factors, or factors which cannot be eliminated, and the second group of controllable factors, or factors that can be eliminated. In the former group fall "tissue susceptibility" and "constitutional predisposition" to ulceration, or ulcer diathesis. The factors which are controllable; i. e., the second group, consists of the following, in order of importance: hyperacidity, focal infection, trauma, smoking, food and drink indiscretions. Since it is impossible to eliminate those factors that are uncontrollable, because

of their innate character, the treatment of peptic ulcer must therefore be directed along such corresponding lines as the modification, control, or complete elimination of those factors belonging to the second group. These methods should form the fundamental principles on which both medical and surgical treatment are based. All patients in our clinic with peptic ulceration, both acute and chronic, are placed upon a rigid regimen which consists of the following: The patient is made to realize the full meaning of his "ulcer diathesis" which cannot be eliminated; that he is a potential "ulcer case" as long as he lives, and must therefore govern his life accordingly. He is told that he must refrain from the use of any form of tobacco and of any alcoholic beverages; he must eliminate all condiments or highly seasoned foods; he must maintain a strict discipline as to diet, which should be of a very bland character with two-hour feedings. All foci of infection are removed, especially infected teeth. If the patient adheres strictly to the above regimen he will be completely relieved of his ulcer symptoms, and in a high percentage of cases the ulcer will heal.

As has been mentioned above, of all the precipitating factors undoubtedly the most important are hypersecretion and hyperacidity. Because of its prominence as a predisposing factor to the development of peptic ulcer in these individuals, it is imperative that the patient totally abstain during his entire life from those things which increase acidity. The complete abstinence from smoking cannot be too strongly emphasized. As a result of his investigations, Gray[33] concluded that tobacco was one of the principal causes of peptic ulcer. Cigarette smoking is particularly detrimental, as has been shown by Moll and Flint[34], Bandel[35] and Friedrich[36]. These investigators have undeniably demonstrated the aggravating influence of smoking in the peptic ulcer patient. Tobacco smoking is detrimental to these individuals because it produces hypersecretion and hyperacidity, spasm of the blood vessels in the stomach, and probably causes pylorospasm (Rolleston[37]). From these investigations and our own clinical observations, we have become so firmly convinced of the importance of this factor that we refuse to treat a patient with peptic ulcer unless he totally abstains from smoking. Similarly as with smoking, the imbibition of alcoholic beverages and the use of condiments are important eliminable factors. Such substances not only increase gastric secretion and acidity, but also produce gastritis and duodenitis.

Aside from avoiding hypersecretion and hyperacidity, it is also of therapeutic importance to produce neutralization of gastric acidity, as has been shown in the previously discussed experimental

investigations. Food ingestion and regurgitation of alkaline duo-denal secretions form the principal modes of normally effecting neutralization. Thus, the frequent administrations of food are essential in the effective neutralization of gastric juice, and the patient must be made to realize the importance of this not only dur-ing the stage of ulcer activity, but during the remainder of his existence.

Although alkalies have been greatly emphasized by gastro-enter-ologists in attempting neutralization of acid gastric secretion, we concur with Barford's[38] opinion of their relative insignificance. Dur-ing the acute stage of the ulcer and in individuals with unusually high gastric acidity we employ alkalies after meals. Calcium car-bonate, as suggested by Loevenhart and Crandall[39], and aluminum hydroxide, as advocated by Crohn[40], Einsel and Rowland[41] and Woldman and Rowland[42], have appeared to us to give the best results. In one group of 24 cases in which the colloidal aluminum hydroxide was administered as an acid neutralizing agent, Jones[43], in the medical clinic at Tulane University, found complete relief of symptoms in all except one case. This relief was obtained within three days after its administration. From his clinical observations he has come to the conclusion that at the present time colloidal alum-inum hydroxide is undoubtedly the best alkaline drug to employ in these cases.

Pylorospasm, as contended by Ivy and Fauley[44], Finney[45], Judd and Waldron[46] and Yates[47], or absence of normal relaxation of the pyloric sphincter, as suggested by Hurat[48], Miller[49] and Martin and Burden[50], probably produces interference with the emptying of the stomach and normal regurgitation of the alkaline duodenal secre-tion, gastric retention, and hypersecretion and hyperacidity. There-fore, in these patients with peptic ulcer who evince this, attempts should be made to correct the vicious circle by inducing relaxation of the sphincter and reestablishing normal function of the pylorus. The administration of such an antispasmodic as tincture of bella-donna in doses varying from 10 to 20 minims three times a day after meals will best accomplish successful relaxation.

At present there is a wave of enthusiasm for the injection treat-ment of peptic ulcer, employing various substances of which vaccine, larostidin (histidine), and synodal (emetine) are the most popular. Unusual claims regarding the relief of symptoms and the cure of ulcers have been made for these drugs. However, Sandweiss[51] has conclusively demonstrated in his cases that the same results can be obtained from the injection of distilled water as from the injection of vaccine, larostidin, and synodal, and made the statement that

the perennial injection of these drugs had a marked psychic effect on the patient. It is our opinion that beneficial results obtained from the use of this form of therapy are due not so much to the medicaments, but rather to the regimen upon which the patient is placed. This almost invariably consists of the basic alkalies, bland diet, and physiologic rest. This latter factor alone has been shown to prevent the development of ulcer in the experimental animal (Stalker, Bollman and Mann[52]).

If the patient adheres strictly to the regimen outlined above and fails to be relieved of his symptoms, or if they are aggravated, it simply means that a complication has occurred and he should then, and only then, be referred to surgery.

The surgical treatment of peptic ulcer consists in the treatment of its complications which are, in the order of importance: perforation, hemorrhage, stenosis, and penetration. By the latter term is meant penetration of the ulcer down to the serosa without perforation, usually associated with constant pain. These complications are generally the result of failure to eliminate completely the precipitating factors previously mentioned. Therefore, the surgical treatment must consist in operations upon the stomach and duodenum that will in turn eliminate the predisposing factors which remained resistant under medical treatment. It is an interesting observation, almost a paradox, that the same surgical procedures used to produce experimental peptic ulcer in the animal, that has no predisposing constitutional ulcer diathesis, are frequently used as curative procedures in the human, who has the uncontrollable "tissue susceptibility" and the "constitutional predisposition" to ulcer. The least the surgeon can learn from the experimental investigations on peptic ulcer is to refrain from performing those operations in which abnormally susceptible portions of the intestinal tract are subjected to the digestive action of the acid gastric chyme. In a consideration of the various surgical procedures which may be employed it is important to classify them into two groups; namely, those applicable to gastric ulceration and those applicable to duodenal ulceration. However, in both the fundamental principle underlying the surgical treatment is the correction of those factors which are controllable; i. e., hyperacidity, pylorospasm, and hypersecretion, which are most active in the pathogenesis and persistence of peptic ulcers. The above factors are eliminated in duodenal ulcer by the performance of pyloroplasties of the Finney, Horsley, or Judd type, preferably the latter, as well as gastroduodenostomy of the Hoffman or Rienhoff type.

In the pyloroplasties and gastroduodenostomies, an attempt is made to reduce gastric acidity by permitting a freer regurgitation

of alkaline duodenal secretions into the stomach and at the same time to retain the physiologic relationship of the stomach and duodenum, so that acid gastric chyme is received by the duodenal mucosa, which is normally accustomed to it and which is much more resistant to its digestive action than is the jejunal mucosa. In either the anterior or posterior gastrojejunostomy, an attempt is made to control precipitating factors by diminishing the amount and character of the gastric secretion and overcoming pylorospasm as a result of the reflux of the alkaline duodenal juices into the stomach, but unfortunately it subjects that part of the gastrointestinal tract which has marked "tissue susceptibility" to ulceration to the constant corrosive action of the acid gastric chyme.

The addition of entero-enterostomy to gastrojejunostomy is always contraindicated, because it results in the same type of "duodenal drainage" used in the experimental animal to produce peptic ulcer. Jejunal ulceration seldom fails to follow this procedure. Therefore, in patients with normal or increased gastric acidity neither the posterior nor anterior gastro-enterostomy should ever be performed, except possibly on those rare occasions where there is an associated acute exacerbation of a chronic ulcer that has produced partial stenosis of the pyloric outlet and a concomitant lymphangitis of the gastrocolic omentum extending over the pyloric antrum. If radical surgery is performed under this rare circumstance, the mortality will be very high. However, gastrojejunostomy should be the procedure of choice in all patients with a long-standing cicatrizing ulcer in the region of the pylorus associated with gastric retention and hypoacidity. The danger of the development of jejunal ulcer in this type of case will be insignificant, because as a result of the long present gastritis caused by prolonged gastric retention, the acid secretion of the stomach is definitely diminished, thus obviating peptic digestion of the susceptible jejunal mucosa.

It is the indiscriminate use of gastro-enterostomy in the presence of acute ulcer or chronic ulcer with normal acidity or hyperacidity that results in complete therapeutic failure, because in the majority of cases a jejunal ulcer will develop, and a characteristic feature of jejunal ulcers is that they frequently perforate. The various procedures that are used in the treatment of gastric ulcer have the same applicable fundamental principles as those used in the treatment of duodenal ulcers, with the exception that the tissue susceptible area in the stomach is usually removed, followed by the restoration of the gastrointestinal tract in such a manner that there will be constant reflux of the alkaline duodenal juices into the stomach. Therefore, the procedures commonly used for gastric ulcer are gastro-

jejunostomy, partial gastrectomy with restoration of the continuity of the gastrointestinal tract by the method of Billroth I and II, or modifications of Billroth II. Where the duodenum can be easily mobilized, Billroth I or Schoemaker's modification are the physiologic operations of choice. When it is impossible completely to mobilize the duodenum, or where too much tension on the suture line is inevitable, the Polya modification of the Billroth II is the operation of choice. In fact, the Polya operation is universally popular, because it is easily performed and gives excellent results, and it is the operation of choice in our clinic. This operation has a two-fold purpose: First, the removal of the area of the stomach in which peptic ulcer predominates; i. e., tissue susceptible area, "the Magenstrasse"; second, the removal of the pyloric sphincter, which allows free regurgitation of the alkaline duodenal juices into the lumen of the remaining stomach, the latter being of extreme importance in both the neutralization of the acid gastric chyme and inhibition of total gastric secretion.

There is another factor that plays an important part in the widespread use of subtotal gastrectomy for peptic ulcer, and that is the ever-present possibility of the ulcer being malignant. It is an incontroversial fact that benign peptic ulceration may undergo malignant transformation as well as that primary gastric malignancy may begin as an ulcer, and it should be appreciated by both the surgeon and the internist. We believe that the incidence of the former is not over 2 per cent to 5 per cent, whereas the latter is of common occurrence. We believe that Lahey is correct in advising operation if a gastric ulcer does not show definite evidence of healing under the influence of strict ulcer regime, as determined by roentgenography. This rule is followed in our clinic, because we feel that failure of the ulcer to reveal healing demonstrates a complication; i. e., extreme chronic fibrosis surrounding an ulcer, penetrating or subacute perforation, or malignancy.

Subtotal gastric resection by any of the varied technics should never be supplemented by an entero-enterostomy, because the same problem holds true here as has been discussed above; that is, the presence of a loop of susceptible jejunal mucosa attached to the stomach which is completely free from all duodenal secretions, and it has been shown that it is the constant reflux of the alkaline duodenal contents into the stomach after resection that is responsible for the great diminution in the quantity and hydrochloric acid content of the gastric chyme. Therefore, in our clinic we never perform entero-enterostomy with gastrojejunostomy in extensive resection of the stomach either for duodenal ulcer or for gastric ulcer.

In spite of any surgical procedures which may have eliminated certain precipitating factors or complications there is always still present the "constitutional predisposition" to ulceration, and surgery has only been an adjunct in the treatment of peptic ulcer. Therefore, the patient must still maintain a strict discipline as regards his personal habits and diet, because variations from a strict regimen over any length of time even after the performance of these various surgical procedures will result in recurrence of an ulcer which usually is then neither in the stomach nor duodenum, but in the jejunum. Such an ulcer is prone to perforate into the free peritoneal cavity or into the colon, the former having a high mortality and the latter seldom recognized until the patient is moribund. As a final admonition, we have found that surgical intervention does not warrant against recurrence of the ulcer or the prevention of severe hemorrhage. It is the consensus that jejunal ulcer should be subjected to surgical treatment, which consists of a subtotal gastrectomy, resection of the segment of jejunum in which the ulcer is present, with an end-to-end anastomosis and a gastrojejunostomy. It is the only procedure that will give gratifying results, provided the patient maintains a strict regimen as regards his ulcer diathesis.

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URINARY TRACT COMPLICATIONS IN GENERAL ABDOMINAL SURGERY

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Charlotte

D R. Engel has confined his remarks largely to complications due to errors in technic. He points out that most of the injuries to the ureters and bladder are due to operations in the pelvis, and cites one case of a ligation of the ureter during an abdominoperineal resection of the rectum. This is very important to us in the smaller towns throughout the South, where the large bulk of surgery done by both the gynecologist and the general surgeon is the surgery having to do with the female organs. Most of the injuries of the ureter and bladder I have encountered have come from gynecologic and obstetric practices and as the result of radium treatment of the cervix uteri. One urologic clinic in my town had had ten referred cases of ureterovaginal fistulas, where the kidney had been removed in the clinic.

Dr. Engel has seen two cases of bilateral ureteral ligation; this accident would necessitate an immediate repair or implantation or transplantation, if recognized at the operation, or a double nephrostomy or pyelostomy after the fashion of a catheter ileostomy in intestinal obstruction soon after the operation, waiting further repair. Some of us have probably ligated a single ureter, but, as the kidney has silently and considerately atrophied, we have been saved the embarrassment of knowing it.

Dr. Engel's suggestion that the injured or severed ureter be repaired immediately and preferably by end-in-end anastomosis using the normal guarding valve of the bladder is the ideal; next in order may be an end-to-end suture with the ureter cut obliquely combining a sort of end-to-end and lateral anastomosis, surrounded by a strip of fascia and an inlying ureteral catheter, and thirdly, an implantation into the bladder. On trying various implantations and transplantations of the ureter into the bladder in dogs, I have found it most difficult and the ultimate results unsatisfactory on account of scarring and rigidity around the transplanted stretch of ureter and the resulting hydronephrosis. This is the chief objection to any implantation or transplantation operation, whether into the bladder or intestine. The former danger of immediate infection can be largely eliminated. The great objection to Dr. Engel's suggestion is the lack of awareness that the ureter has been injured at all, during the operation.

The recent threat of an intraligamentous fibroid and a cyst between the folds of the broad ligament intimately attached down into the pelvis and the abdominal stage of an abdominoperineal resection of the rectum made me careful to identify the ureters. I think Dr. Engel's letter to me in which he mentioned the accidental ligation of the ureter must have come as a warning today, the very day I had done this operation with the left ureter purposely in full view.

Dr. Engel finally discusses the question of cystitis and postoperative urinary retention, and warns us not only against a too rapid or careless stripping away of the bladder, but against injury to the prevesical nerve and hypogastric plexus by following in all our pelvic dissections the proper anatomic planes. To do this means a clearer picture of the anatomy of the pelvis, a consideration and an identification of the ureters, particularly, throughout the operation. This can only be assured by routine ureteral catheterization with catheter left in place. Dr. Engel advocates frequent intermittent catheterization, and I should add lavage, in preference to a retention catheter. Any foreign body in the bladder quickly gathers deposits and is a decided irritant to the bladder. I have felt that even in vesicovaginal fistulas repaired through a suprapubic cystotomy, that the results would be better in quicker healing if a form of smaller tube with diaphragm, like the one described by Dr. Nicolson for cecostomy, were used without urethral catheter, and the patient turned on the abdomen. The prone position, the reverse of the abdominal, allows cystotomy incisions to heal readily, and the same principle of keeping the fistulous opening on top favors closure.

It is always preferable by pelvic, ureteral, and vesical repairs or implantations to route the urine over its accustomed passages, but for whatever reason impossible—(length of ureter, its blood supply, scarring, finding it among adhesions or scar at a low level)— the ureters must be transplanted into the rectosigmoid and the easiest and surest method of doing it is, after the ureter has been placed against the mucosa, to pass a hair-pin wire, straddling the ureter down a No. 18 whistle tip catheter or rectal tube, and after a few days, apply an electrocutting current to the wire, thus severing and detaching the ureter, and creating the fistula. This procedure is quick, easy, effective, and facilitates a following cystectomy, when the attached ureteral stumps can be disregarded. Since this method can be done by any general surgeon, I think it should be tried before the single kidney is sacrificed by either tying off the ureter or removing the kidney.

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SUPRAHEPATIC (SUBPHRENIC) ABSCESS

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IN the University of Virginia Hospital during the years 1922 to
1936, there are records of 20 cases of subphrenic abscess (Table
1). This study was initiated because of the difficulty experienced by
the authors in the diagnosis of these cases, most of which have been
observed by them. In correlating our experience with that recorded
in the literature, a number of discrepancies have come to light be-
tween our conclusions and those of other authors, who differ also
in considerable degree among themselves. Using our material as
illustrative and without attempting a systematic review, we will pre-
sent disputed points in the hope that this difficult subject may per-
haps become a little less obscure.

TABLE 1
Cases of Subphrenic Abscess

	No. Cases
Diagnosed and operated upon in acute stage	15
Found at operation under other diagnosis	2
Found at postmortem	2
Diagnosed in chronic stage	1
Total	20

White 17   Male 12
Colored 3   Female 8

Age—11 to 66 years. Average—35 years.

By Decades

0-10	11-20	21-30	31-40	41-50	51-60	61-70
0	4	4	4	6	0	2

In the first place, there is no agreement in the definition of sub-
phrenic abscess. Following the lead of Barnard[1], the general tend-
ency has been to regard the entire area from the transverse meso-
colon to the diaphragm as representing the subphrenic space and
to divide it primarily into a suprahepatic and an infrahepatic por-
tion[3, 10, 21, 22]. If one defines a subphrenic abscess as one in contact
with the diaphragm, as Barnard does, then no doubt an abscess in
the lesser sac or one beneath the liver is truly a subphrenic abscess.

To some authors this conception is not practically useful and their reports[2,11,14] are based only on abscesses between the superior surface of the liver and the diaphragm. Obviously, if progress in diagnosis and treatment is to be made, uniformity of definition is the first essential. Ochsner and Graves[22] accept Barnard's definition of the subphrenic space and yet they include in their report infrahepatic abscesses only when they are associated with abscesses elsewhere[31]. This limitation is obviously somewhat inconsistent, but its very inconsistency illustrates the point. After all, the problems of infection above the liver differ from those of infection beneath the liver. Diagnosis is much less obscure in infrahepatic than in suprahepatic abscess because, first, the former is almost always preceded by violent local symptoms and signs in the hypochondrium or epigastrium, due to the causal disease; second, because infrahepatic abscess declares itself by local signs in the same region, tenderness, spasm, mass; and, third, because an abscess below the liver is rarely accompanied by diagnostically confusing phenomena resulting from disease in the chest such as the pleural effusion and pneumonitis so frequently associated with infection above the liver. Furthermore, all uncomplicated infrahepatic abscesses can be approached directly and easily by laparotomy; the area is accessible. The problems presented by abscesses in the two localities are then quite distinct; and it would serve the purposes of clarity if this distinction could be uniformly recognized. We suggest that the subject be discussed under the term "suprahepatic abscess," rather than under the term "subphrenic abscess." In the present paper there are included only cases of abscess between the superior surface of the liver and the diaphragm.

The anatomy of the subphrenic space has been described minutely by most authors[16,17,21,22,23], again with no complete uniformity. It is not hard to see why this confusion has occurred. Except for division by the coronary and falciform ligaments into right and left portions, the space is so complex in outline, often so modified in position and dimensions by the disease itself, and so rarely seen in anything approaching its entirety in the living subject, that one's powers of three-dimensional visualization are strained. The suprahepatic space is commonly divided into intraperitoneal and extraperitoneal areas, the most important of the latter representing the area of attachment of the coronary ligament. The coronary ligament and its prolongation, the right lateral ligament, separate the right superior surface into a posterior and an anterior intraperitoneal space. The left suprahepatic area is not divided but consists of a single intraperitoneal space. The last three spaces have been named respectively (1) the right posterior superior space, (2) the

right anterior superior space, and (3) the left superior space. The existence of the first of these, the right posterior superior space, has been disputed by several observers, who believe it to be really a portion of the right infrahepatic pouch[10,16]. The right anterior superior space is enormously larger than the right posterior superior space, representing almost if not quite all of the extensive peritoneum-covered surface of the right lobe.

In addition to variations in anatomic description, this aspect of the subject is still further confused by the fact that subphrenic abscess does not necessarily confine itself to a single space. On account of this fact the clinical and operative determination of the space or spaces involved is often impossible. There is uniform agreement that the right side is involved much more frequently than the left; in Ochsner and Graves'[22] combined series from the literature, the proportion is about 5 to 2, and Overholt and Donchess[23] give it at 9 to 1. The differentiation between right and left is, of course, easy. When clinical differentiation is attempted, however, between anterior and posterior, and between extraperitoneal and intraperitoneal spaces, doubt may well arise, and has arisen in several minds. The anatomically defined and disputed right posterior superior space is generally stated as the most frequent site of subphrenic abscess, in Ochsner and Graves' series 60 per cent of 49 cases. On the other hand Piquand[25] and Delario[7] both report the anterior space to be infected about three times as often as the posterior space. When one realizes that the latter is at best a narrow slit at the lower border of the liver behind, at some distance from the more mobile portion of the diaphragm and in close proximity to the eleventh and twelfth ribs, one may wonder how an abscess confined therein could produce the typical x-ray and clinical findings so often seen, particularly the high elevation of the diaphragm. Overholt and Donchess[23] in an excellent review say: "The division of the two spaces on the right side has little practical significance because most collections are not limited strictly to either space but spread laterally over the free liver surface." It is probable that in many instances the conclusion has been reached that pus is in the posterior superior space, only because it has to be approached posteriorly, whereas in truth it is in the posterior portion of the anterior space. We believe that we have been guilty of this loose reasoning; and we are not willing, therefore, to present our material as accurately localized anatomically.

There is just as great difficulty in differentiating intraperitoneal from extraperitoneal infection. Clinically one has to break through an abscess wall for drainage, and there is no way of demonstrating that the broken wall contains or does not contain a layer represent-

ing the former serosa. Janz[14] believes with some soundness that this differentiation is impossible.

The only important practical point that must be determined is whether to approach from behind or in front. In the face of an abscess already beyond the limits of its original space, anatomic

TABLE 2
Location of Abscesses

	Recovered	Died	Total
Right, anterior	4	0	4
Right, posterior	9	4	13
Left	1	2	3
Total...........................	14	6	20

(See text for this classification)

niceties are often not definable and are never of therapeutic significance. We believe that further simplification of this confused subject can be obtained if cases are classified into three groups only: (1) left-sided abscess; (2) right-sided abscess, posterior approach, and (3) right-sided abscess, anterior approach (Table 2). Pi-

TABLE 3
Etiology and Location

	Right Ant.	Right Post.	Left	Total
1. Peritonitis from				
(a) Appendicitis	1	6	2	9
(b) Septic abortion	1	0	0	1
(c) Acute pancreatitis	0	0	1	1
2. Perforation of				
(a) Duodenum (ulcer)	1	1	0	2
(b) Bowel (multiple, g. s. w.)........	1	0	0	1
(c) Cecum (carcinoma)	0	1	0	1
3. Operation on				
(a) Pylorus	0	1	0	1
(b) Biliary tract	0	3	0	3
4. Unknown	0	1	0	1
Total......................	4	13	3	20

quand[25] nearly 30 years ago proposed a classification of clinical types on somewhat the same principle, although different in detail, but in the search for greater anatomic accuracy his proposal has received little attention. Such a classification is of practical merit, inasmuch as each of the three groups presents separate characteristics both diagnostically and therapeutically. In addition notation

should, of course, be made of those abscesses associated with infrahepatic infection. This perhaps less accurate and certainly simpler classification will probably be found to correlate with the etiology at least as closely as the more complex grouping (Table 3).

The etiology of subphrenic abscess has been presented by others and we present our figures (Table 3). It seems worth while, however, to comment on the mechanism of spread of infection to the subphrenic space, again because the literature is not entirely convincing. There are three possible routes of spread from a distant intra-abdominal focus to the subphrenic area: (1) by direct spread of contaminated fluid in the course of a general peritonitis; in this instance the resulting abscess may be called a "residual abscess" corresponding to residual abscesses elsewhere; (2) by propagation of infection along the surface of the peritoneum; a process possibly aided by certain factors to be discussed; (3) by retroperitoneal lymphangitis or cellulitis. In addition, of course, the space may be directly contaminated by a penetrating wound or by the emptying into it of a nearby focus, such as a liver abscess. However, the exact route of spread in practically no individual case is determinable; nor is it important. The importance of these considerations lies in the choice of measures adopted for the prevention of subphrenic abscess.

The problem of prophylaxis has many aspects. There is little doubt that an established general peritonitis always carries with it the possibility of a residual abscess in the subphrenic space and that many cases of subphrenic abscess are caused in this way. In one untreated case in our series, postmortem disclosed general suppurative peritonitis with multiple pockets of pus, of which the subphrenic collection was only one. This mechanism, together with spread from localized peritoneal foci, makes the proper treatment of the original disease the most important element of prophylaxis, that is the prevention of any peritoneal or retroperitoneal infection.

It has appeared important to most writers to reach some conclusion as to the probability of intraperitoneal versus retroperitoneal spread from a localized focus. In the former instance it is assumed that gravity may be of importance in favoring or discouraging spread of infection upward. On account of the occurrence of subphrenic abscess without evidence of peritonitis intervening between the original focus and the later lesion, Janz[14] and others believe that the subperitoneal route explains almost all abscesses not residual in origin. Truesdale[28] has summarized the anatomic evidence on the rich lymphatic distribution favoring this route and takes the same position.

On the other hand, to judge from the almost universally favorable opinion of the value of gravity as exerted in Fowler's position, most observers[3, 7, 16, 21, 22, 29] feel that an important proportion of cases spread by the simple process of pus running downhill. Without entering into the much discussed question of the advantages and disadvantages of Fowler's position, we question the simplicity of this conception on two counts. In the first place, after a peritoneal inflammatory reaction is established, there is little opportunity for fluids to flow. The gross pathologic picture presented by any extensive suppurative peritonitis bears out this contention. Pockets of fluid are found in all portions of the peritoneum, even completely anterior against the anterior abdominal wall. In the second place, if gravity in an earlier stage should be believed to determine the occurrence of subphrenic abscess, no explanation exists for the frequent location high over the dome of the liver without involvement of the right subhepatic fossa, the low spot topographically in the upper abdomen[5, 6]. The combination of infection in these two areas occurs but it is not the rule[22]. Overholt and Donchess[23] have recently suggested, on the basis of experimental study of intra-abdominal pressures, that increase of negative pressure in the subdiaphragmatic area with each inspiration might serve to favor the spread of infection upwards by a repeated sucking mechanism. This ingenious suggestion may have some validity, but it still does not explain why the reservoir from which the infection has presumably been sucked upward is so often dry with no trace of ever having been infected. We would not suggest the abandonment of the use of Fowler's position on the basis of these considerations alone, but we would indicate that too positive statements of its efficacy are unwarranted. Certainly most surgeons of experience have seen subphrenic abscess develop in the face of a well-maintained Fowler's position.

One other pathologic point with direct bearing on the clinical aspects of this disease must be briefly mentioned, namely, the occurrence of subphrenic infection without the determination of a later abscess. That this phenomenon may occur must be accepted from analogy with the behavior of the peritoneum elsewhere. In our series there occurred one case in which, after transthoracic exposure of the diaphragm at the first stage of a planned two-stage procedure, 1 c.c. of thin, purulent fluid was aspirated with a hypodermic needle from beneath the diaphragm. This case had had an entirely typical course and presented characteristic clinical and radiologic signs. Following the first stage, immediate spontaneous improvement began and the patient recovered without further operative measures. Numbers of cases have been reported in which an apparently clear-cut diagnosis of subphrenic infection has been followed

by equally satisfactory recovery[19]. Ochsner and Graves[22] make the statement that 70 per cent of subphrenic infections do not eventuate in abscess. In view of the difficulties in the diagnosis of established abscess, we and others[15] doubt the validity of any percentage estimation of this relationship. The failure to suspect subphrenic abscess is notorious in the surgery of this disease. More importantly, however, we as well as others[8] have explored the subphrenic space under the diagnosis of abscess with negative findings. These cases are to be reported elsewhere.[34] Spontaneous disappearance of subphrenic infection undoubtedly occurs, but how often it occurs must be a matter of speculation alone.

TABLE 4
Interval Between Onset of Original Disease and Operation for
Subphrenic Abscess (17 cases)

Longest interval	12 months
Shortest interval	2 weeks
Average interval (15 cases)	12 weeks
Unknown	2 cases

Curiously enough in the discussion of this phenomenon we have found no reference to an interesting point. The insidious nature of subphrenic abscess, its propensity to remain hidden for long periods after the initiating infection—as long as seven years[14]—are mentioned in practically all papers on the subject (See Table 4). Yet spontaneous recovery from a condition strongly suggesting subphrenic infection is always assumed to be permanent. It is quite possible that some of these cases of apparent recovery carry latent subphrenic infection with them, possibly to remain as a minor drag on the well-being of the individual, possibly to eventuate after a longer or shorter interval in a true abscess. Completely recovery should not be lightly assumed.

TABLE 5
Bacteriology (17 cases)

Bacillus coli	5
Streptococcus hemolyticus	1
Streptococcus non-hemolyticus	3
Staphylococcus aureus	1
Culture negative	5
No culture	3

(One case showed mixed culture of B. coli and Str. non-hemolyticus)

Although the matters we have discussed are unsettled and confusing enough, we now approach the most difficult phase of this difficult disease, namely, the problem of diagnosis. Although most

authors state the difficulties of diagnosis, yet their listing of classic symptoms and signs unquestionably tends to foster the idea in the inexperienced that the diagnosis is simple, an idea intensified by the occasional direct statement that it is actually so[17,20,24]. The situation has been best expressed by Green, who opened his discussion of LeWald's paper[15] on roentgenologic diagnosis of subphrenic abscess by the statement that the "differential diagnosis . . . is apparently as difficult as Dr. LeWald's presentation of it is simple." We do not intend to suggest that no profit is to be derived from the analysis of symptomatology, physical findings, and x-ray appearances. In

TABLE 6
Mortality

Cases operated upon	17	
Died		4
Mortality		23.5%
Cases not operated upon	3	
Died		2
Mortality		66.6%
Total cases	20	
Died		6
Mortality		30.0%

Causes of Death

	Postmortem
Cases operated upon:	
1. Perforation into pleura after 1st stage	Yes
2. Acute hemorrhage from duodenal ulcer	Yes
3. Pulmonary embolism while convalescent	No
4. Empyema, pneumonia	Yes
Cases not operated upon:	
1. General peritonitis with multiple abscesses	Yes
2. Massive hemorrhage from pancreas	Yes

order to diminish our diagnostic errors to the minimum it goes without saying that we must be thoroughly familiar with the characteristic phenomena. We do intend to present a warning that in the presence of the individual patient one's familiarity with the typical course and findings may prove to be a surprisingly treacherous guide.

We will not add another textbook description of this disease in its characteristic manifestations, but will discuss certain perhaps disjointed considerations that have developed from our personal experience. Of our 20 cases of subphrenic abscess (Table 1), operation was performed in 17, in 15 under a correct preoperative diagnosis. Of the remaining two patients operated on, one was explored by a member of our urologic staff for a supposed perinephric abscess and the other was explored under a diagnosis of splenic abscess, which was in fact present, having ruptured into the left subphrenic

space. Of the three cases not operated on, two were discovered only at postmortem (Table 6). One of these patients had been extremely ill from repeated hemorrhages following acute hemorrhagic pancreatitis, from which he died. He had never been suspected of subphrenic abscess and was never in condition for adequate study. The second, already mentioned, died within a few days of the onset of gangrenous appendicitis from generalized peritonitis with the subphrenic collection as a part only of the widespread process. The third patient unoperated on recovered, and yet this case is more disturbing as an index of diagnostic possibility and accomplishment than either of the others. This patient underwent cholecystectomy and choledochostomy, followed in six weeks by transduodenal choledochostomy for missed stone. Between the two operations she developed a mild febrile state, lasting from three to four weeks, accompanied by signs of consolidation in the right base. Bronchopneumonia was diagnosed on physical signs with the aid of the x-ray. It should be noted that subphrenic abscess was considered by one of us (V. W. A.) in the interpretation of the films, but only as a remote possibility. With apparent spontaneous recovery from the complication, no further thought was given to it. Subphrenic abscess was finally diagnosed many weeks after the second operation by x-ray after injection of iodized oil into a persistent abdominal sinus. This case illustrates a statement that occurs many times in the literature, namely that subphrenic abscess may be present without any characteristic symptoms or signs[4, 9, 14]. The point is further illustrated in our 20 cases, in which on physical examination there were recorded only 10 instances of elevation and two of fixation of the diaphragm; 4 of tenderness over the subphrenic area; and 12 of abdominal tenderness and spasm. During the course of observation the following tentative or alternative thoracic diagnoses recur: pneumonia, lung abscess, pleurisy with effusion, empyema, and atelectasis. Although, in some instances, one or more of these conditions was actually present, in others the signs were unquestionably mimicked by the subdiaphragmatic disturbance.

The unreliability of physical signs has determined the generally accepted opinion that the x-ray offers the most reliable single guide in diagnosis, not excluding aspiration. This opinion has been bolstered by the statements of several radiologists that x-ray diagnosis is not difficult[12, 15, 17, 20, 24]. In the occasional presence of gas in the abscess, this is unquestionably true; but in the great majority of cases, in which gas is not present, such statements are misleading. Certainly, in our experience as well as in that of others, x-ray diagnosis has its own obscurities, not decreased by the fact that in many suspected cases, the patient is too sick for adequate radiologic exam-

ination. Limitation to bedside films naturally hampers roentgen diagnosis, and tends to increase the percentage of error; but it is by no means the only cause of error. In several of our cases in which complete radiologic study was possible, errors were made, both in positive and negative diagnosis. As stressed by many writers, the cardinal x-ray signs of subphrenic abscess are: elevation and immobility of the diaphragm, the elevation being mainly posterior; and pneumonitis in the lung immediately adjacent to the diaphragm.

Visualization of the diaphragm is often difficult or impossible, due either to intrapleural fluid or to an associated pneumonia. An accurate localization of the diaphragm is certainly helpful in diagnosis and LeWald's suggestion of injecting air into the pleura for this purpose seems to have some merit. When advisable, we intend to try this procedure, which may aid in establishing not only the position but also the mobility of the diaphragm.

Diaphragmatic elevation and immobility are observed in conditions other than subphrenic abscess, particularly within ten days following a laparotomy[23]. Simple pleurisy may give rise to the same finding, as may a paralysis of the phrenic nerve. On the other hand, a few of our cases of proven subphrenic abscess, in good enough condition to be studied carefully, have shown none of the cardinal points.

We believe in general that, although radiologic methods of diagnosis are helpful, the cardinal signs when present are not necessarily diagnostic, and their absence does not deny abscess formation. The first of these conclusions, namely that the so-called pathognomonic x-ray signs of subphrenic abscess are found in other conditions, seems to us one of the most striking lessons of our experience with this disease.

A final diagnostic means that has suggested itself for many years is exploratory aspiration. The majority of recent commentators condemn aspiration on two counts: first, its unreliability; and second, its danger. On the first count, for instance, Overholt and Donchess[23] report seven of 21 aspirations negative when pus was actually present. On the second count, a curious inconsistency runs through the literature. Almost every author points to the danger of contaminating the uninvolved pleura as the chief objection to aspiration, and yet many of these surgeons believe that aspiration is safe if immediate operation follows the demonstration of pus[3,11,14,30]. It seems clear that, if aspiration is dangerous, the danger has not been entirely removed by operation. Ochsner and Graves[22] and Doherty and Rowlands[8] recognize this fact and propose that aspira-

tion, if indicated, be done by an extraserous route, a method obviously difficult to carry out with full assurance that no serous cavity is entered. Overholt and Donchess[25], Ochsner and Graves[22], Schwartz[27], Russell[26], Doherty and Rowlands[8] and Janz[14] all suggest substitution of operative exploration in some form or other for aspiration. We believe that exploratory operation has not received sufficient emphasis; and in an attempt to give it emphasis we are preparing a further report on a series of cases in which exploration was negative.[34] We believe that diagnostic aspiration should never be attempted, and that in cases of doubt exploratory operation under local anesthesia should be undertaken as the final step in diagnosis.

One more point in regard to aspiration needs comment. It is often stated that a diagnostic aspiration of the pleura is justified for purposes of differentiation between infection above and below the diaphragm[22]. This procedure, we believe, is not without its own danger. We have twice inadvertently entered a subphrenic abscess and have thereby contaminated the pleura, while attempting to aspirate the pleura alone. The ease with which this accident can occur depends, of course, on the fact that a subphrenic abscess of any real size, by pressure outwards, may obliterate in its lower portion the space between the parietal and diaphragmatic layers of the pleura.

In no disease is diagnosis so largely a question of differential diagnosis as in subphrenic abscess. The clinical course usually suggests an infectious process, and the symptoms and signs its approximate location. Whether the infection is below, within, or above the liver, or in the chest is the usual problem presented. In many instances of liver abscess we believe with others[1,9,27] that differentiation from subphrenic abscess is impossible. We have operated on three cases of this disease with absolutely typical symptoms, signs, and roentgenologic findings of subphrenic abscess. If one accepts the propriety of exploratory operation, such errors are not serious, as exploration will frequently lead to adequate surgical treatment of the liver abscess. The differential diagnosis between intrathoracic and subdiaphragmatic infection is of greater importance; and its difficulty is enhanced by the fact that subphrenic abscess is so frequently accompanied by pathologic processes in the pleura or lung[2,4,15]. Again exploration under local anesthesia must be the final step, a step not to be too long deferred. The longer subphrenic abscess has existed, the more possibility is there of intrathoracic complication and, by the same token, the more difficult the diagnosis of the subphrenic abscess and the less favorable the prognosis.

The most important single point in the diagnosis of subphrenic abscess is to be alert for the possibility of its presence. Among the five cases not diagnosed in our series, subphrenic abscess was not considered in four. Any otherwise unexplained persistence or recurrence of fever in a case of intra-abdominal suppuration, or following operation on, or injury to the gastrointestinal or biliary tract, must create suspicion of subphrenic abscess. One must also remember that subphrenic abscess may occur without any known preceding intra-abdominal disease and rarely may follow intrathoracic infection.

TABLE 7
Types of Operation (17 cases)

	Recovered	Died
Anterior		
Transperitoneal	5	0
Extraperitoneal	1	0
Posterior		
Transpleural		
One stage	2	2
Two stage	3	0
Two stage (first stage only)....................	1	1
Extraserous (Nather and Ochsner type)..............	2	1
	14*	4

*Thirteen patients recovered; but one patient had a posterior extraserous exploration after anterior drainage appeared to be inadequate. Operative recoveries are therefore one greater than patient recoveries.

Our experience furnishes little new to say in regard to the operative treatment (Table 7). Ullman and Levy[29], Nather and Ochsner[18], Ochsner and Graves[22], and others have adequately made the case for the general principle of an extraserous approach, whether anterior or posterior. It is interesting that, as far back as 1897, this principle was recognized in the description of a transthoracic approach with reflection of the pleural sulcus before incising the diaphragm[32]. In our earlier cases we were satisfied with the two-stage transthoracic approach, protecting the pleura by suture and packing for from three to four days. After one fatality from massive perforation of the abscess into the pleura above the packed area before the second stage was reached, we now prefer the one-stage extraserous procedure of Nather and Ochsner[18] for posterior approach. For anterior approach, the extraperitoneal route is chosen. The experience just cited has impressed upon us the urgent necessity of immediate operation when the diagnosis is made, or of exploration

not too long delayed. It need not be added that any exploratory procedure must also be done according to the same sound principle of extraserous attack under local anesthesia.

The serious prognosis of untreated subphrenic abscess needs no comment. Ochsner and Graves[22], collecting cases from a wide survey of the literature, report an average mortality of over 90 per cent. The significance of the mortality in surgically treated cases needs some elaboration. It has been said that when death follows operation it is due either to the treatment or to the original disease, never to the subphrenic abscess. That there may be some truth in this statement is illustrated by the present series (Table 6). Four deaths occurred after operation. Two of these almost certainly were the result of the original disease: one, massive hemorrhage from a duodenal ulcer, and the other, pulmonary embolism, occurring when the patient was convalescent sixteen days after an extraserous drainage. In the other two cases death must be ascribed directly to treatment. One is the case cited in which delay in drainage as the result of the choice of a two-stage procedure permitted perforation of the diaphragm. The second patient died of empyema and pneumonia following aspiration and a one-stage transthoracic operation. We believe that these two deaths could have been avoided and our mortality halved by proper surgical treatment. In spite of this failure to treat all of our cases with faultless judgment, our mortality compares favorably with the general experience. Ochsner and Graves[22] collected from the literature 1,693 cases with a hospital mortality of 33.6 per cent, their own mortality in 50 cases being 32 per cent. The present series has shown a hospital mortality in 17 cases of 23.5 per cent, about three-quarters of the average mortality and less than the mortality given in 22 of 27 individual reports tabulated by them. Our total mortality for the 20 cases, of which three were not drained, is 30.0 per cent, which may be compared with an average total of 56 per cent in 2,765 cases collected by Ochsner and Graves[22]. In spite of the favorable comparative appearance of our results, we present them regretfully, believing that they are not as satisfactory as they should be. This is particularly emphasized by the fact that, as far back as 1909, an operative mortality rate of only 26.0 per cent was reported by both Piquand[25] and Ferutz[33], a figure not significantly worse than our own. Had we been able to present an operative series containing only the two deaths from presumably unavoidable causes, our mortality rate would have been at a truly commendable level of less than 12.0 per cent. Although the present survey has been illuminating to us in many ways, we believe that its not least important lesson is the responsibility of the surgeon himself for a proportion of the deaths in subphrenic abscess.

SUMMARY

On the basis of a survey of the literature of subphrenic abscess and of an analysis of 20 cases, the following opinions are expressed:

1. Surgeons should agree on the definition of subphrenic abscess. Reasons are given for limiting the definition to cover only abscesses between the superior surface of the liver and the diaphragm.

2. Accuracy of anatomic localization of individual abscesses to the commonly defined subdivisions of the space is considered impossible and unimportant. Reasons are given for the value of a simple clinical classification as used herein.

3. The value of Fowler's position in prophylaxis is questioned.

4. Classic symptoms and signs may be entirely absent, or may be completely masked by coincident intrathoracic disease. Similarly, the classic roentgenologic findings may be absent in the presence of abscess or present when no abscess exists.

5. Exploratory operation under local anesthesia should replace diagnostic aspiration, which should never be attempted.

6. The principle of extraserous surgical approach is sound.

7. A proportion of the mortality after operation is due to unwisely chosen or poorly executed surgical attack.

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MICROCOCCUS TETRAGENUS AS A SURGICAL COMPLICATION

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THE facts that tetragenous infections have been frequently overlooked; that they appear in relation to many other conditions, but are relatively rare as a complication of purely surgical conditions, constitute sufficient justification for reporting this unusual case.

Report of Case

A white boy, aged 15, was admitted to Bowling Green City Hospital on March 28, 1932. A week earlier he had begun to suffer from abdominal pains which localized in the right lower quadrant. The day before admission the attending physician discovered a mass at McBurney's point with marked muscular rigidity of the right half of the abdomen. Diagnosis: Suppurative appendicitis with abscess formation.

At operation 2 to 3 ounces of yellowish offensive pus were evacuated. No search was made for the appendix, but two soft rubber drains were placed in the abscess cavity: these were removed a week later.

For two weeks after operation his course was uneventful, but then it became stormy, with repeated chills and high fever. Studies for malaria were negative. Blood culture taken on April 19 was reported positive for *micrococcus tetragenus.*

Repeated transfusions, various dyes, neoarsphenamine and foreign protein were administered. On June 23, his temperature having been normal or below for eight days, the boy was dismissed.

He returned on August 26. He had gained much in strength and weight for about seven weeks, but then he had begun to lose strength. About a week before readmission he had had several chills and fever.

At noon on the 26th his temperature was 97.4, pulse 110, leukocytes 11,500 with 93 per cent polymorphonuclears. The red blood cells were 3,550,000. Within an hour he had a severe chill and at 4 p. m. temperature was 104.6, pulse 140. Blood was taken an hour later for culture. This was observed for 12 to 14 days but no growth was found. During the first week he had one or two chills in each 24 hours, the temperature varying from 96 to 104.8, the pulse from 100 to 160. During the second week evening temperature was not over 99.6.

There was rather marked gaseous distention of the abdomen, nausea and vomiting were both rather frequent during the first week, and at one time he showed a tendency to diarrhea.

We insisted on blood transfusions, but the patient refused them absolutely. After two and a half weeks' stay without improvement the boy went home against advice and we were informed that he died ten days later in exhaustion.

THE ORGANISM

In our case the technician reported as follows: "Fifteen cubic centimeters of the patient's blood were withdrawn and inoculated directly into a flask containing about 150 c.c. of plain broth. This was incubated at 37 C. After 48 hours a faint clouding of the medium was perceptible. This cloud increased gradually. After 5 days' incubation a good growth was obtained. Smears made from the broth showed large Gram-positive cocci arranged in tetrads and surrounded by a capsule. Subsequent attempts to culture the organism from the patient's blood were futile."

The organisms we.e found almost exclusively in tetrads, relatively few diplococci being found. The tetrads varied in size and many of them were apparently undergoing fission. No variations in color were noted by our technician since no extensive study was made of the cultures after the identity of the organism was established. Later cultures were obtained from the Kentucky State Board of Health Laboratory and from the Morris Institute of Infectious Diseases, Chicago, and it was noted that the tetrads in these were all of practically the same size.

Recently a study has been made by Reimann[10] of the variant forms of this organism who states "About 40 years ago a controversy existed as to whether numerous strains of *Micrococcus tetragenus* existed or if the various kinds then studied were merely variant forms of a single strain. Those favoring the first point of view denoted separate strains by the terms, subflavus, aureus, albus, citreus and ruber. Others believed these to be merely variant forms of a single strain. It appears now that both views were correct; numerous strains exist and each has variant forms." This study by Reimann is the most complete in the English literature and serves to give the true status of the tetragenus, giving its various strains and forms, and helping to separate it from the staphylococcus, a cause of much discussion and many differences of opinion.

CLINICAL MANIFESTATIONS

After Gaffky's discovery of the micrococcus tetragenus in 1881 it was at first considered a harmless saphrophyte because of its frequent presence in the nasopharynx and in tuberculous cavities. Unquestionably its low virulence is responsible for its relatively infrequent presence as a cause of active infection. In practically all cases it is found as a causative factor in individuals whose resistance has been lowered by previous disease.

Its pathogenicity was first recognized by Jakowski in 1886. The

first cases of septicemia due to this organism were reported by
Mya and Trambusti.

In most cases reported in the literature the infection has occurred
as a septicemia, and usually has followed some infection in the
respiratory tract, as would be expected from its usual localization
in the body. Cases have been reported by a number of European
observers. Anemia has been cited as a predisposing factor by sev-
eral authors. Typhoid fever may precede or follow a septicemia
due to *micrococcus tetragenus* according to some. The occurrence
of this organism with infections due to streptococci and brucelliasis
have been reported. A number of cases have been reported as
occurring in the course of infections of the urinary tract.

Among surgical and obstetric cases that may have had a causal
relationship to the entrance of the *M. tetragenus* into the body and
to the development of a secondary septicemia may be noted the
cases of abscess mentioned by von Ofenheim[1], who also remarked
that he had seen 7 cases of septicemia with pleurisy and only 3 cases
of septicemia without pleurisy. Stroebel recorded a case of "tho-
racotomy" as the predisposing factor with a complicating arthritis;
undoubtedly another case of pleurisy. Castaigne reported a case of
fractured leg with the gradual development of septicemia; after 7
months this patient died with complicating pneumonia and abscesses
of the spleen and kidneys. Caldera and Pinaroli[3] report a case of
chronic mastoiditis which developed septicemia suddenly and re-
sulted fatally from empyema and gangrene of lung.

Among the obstetric cases mentioned may be cited that of Bezan-
con and Lepage "following childbirth", developing septicemia and
dying from meningitis. In Meltzer's[2] cases he reports two as "post-
partum", both developing suddenly, one lasting 9 days and one 4
months, and in both cases streptococci were also found in the blood.

As to secondary localization in different parts of the body many
cases have been reported as follows (according to Reimann) : arth-
ritis; meningitis; respiratory tract lesions including mouth infections,
pharyngitis, otitis media, bronchitis, pneumonia and empyema;
endocarditis; pericarditis; puerperal infection; peritonitis; perineph-
ric abscess; pyosalpinx. Battistini reported glomerulonephritis
during septicemia and cultivated *M. tetragenus* from the patient's
urine. Exanthemata have been noted by several observers. Gaucher
noted purpura.

TREATMENT

In the case reported herewith we were at the time absolutely
ignorant as to treatment indicated, nor did we receive any help from

any available text or journal on medicine or surgery. In fact, in the American literature there is practically no mention of any relationship of *micrococcus tetragenus* to any disease condition.

In order we used the following: Quinine sulphate by mouth, metaphen intravenously, blood transfusions, 6 in number, gentian violet intravenously, neoarsphenamine intravenously, and milk protein intramuscularly; all of these in addition to the usual symptomatic treatment.

Robinson[5] reported a case of tetragenus septicemia with rheumatic symptoms, and a complicating purulent otitis media, the organism being found in the blood and the pus from the ear. He advocates the use of quinine in large doses in these infections since it had proven of value "in tetragenus pneumonia."

Byers and Houston[4] reported a chronic, prolonged case of respiratory infection in a 10 year old boy. They had isolated a streptococcus, *micrococcus catarrhalis* and a diplococcus, and after finding *micrococcus tetragenus* they used a mixed autogenous vaccine and relieved the child of what formerly would have been "clinically a galloping consumption."

Luedke[6] reported 3 cases in males, 1 with typhoid fever and 2 with sore throat as predisposing factors. All three patients recovered. They were "given specific vaccine" according to the comment.

Gayet[7] reported a case of *M. tetragenus* infection in the urinary passages, the organism being found in the urine. He made an autogenous vaccine and states that it was efficacious.

Kimmerle[8] in reporting 2 cases spoke of "the specific therapy of Dr. Luedke" as the best treatment. He also states that arsphenamine gave favorable results.

Summary

Micrococcus tetragenus has been found as a rule in the upper air passages and in the presence of tuberculous cavities, but ordinarily it produces no symptoms; in fact it has been considered a harmless saprophyte by most bacteriologists.

Since it varies so much in color and cultures, producing white, yellow, translucent, pink, and even other colors under proper cultural surroundings, it has frequently been confused with staphylococcus.

Most cases of tetragenus infection have occurred as a sporadic septicemia, many of them associated with other organisms, and most of them showing secondary purulent complications. Few cases have been found in association with so-called purely surgical conditions.

Few cases have been found in American and British literature. To date some 175 to 180 cases of *micrococcus tetragenus* infection have appeared in the literature, mostly in French, Italian, Spanish and German medical journals.

A case is reported in which an ordinary case of suppurative appendicitis with abscess formation was followed in about two weeks by symptoms of classic septicemia. *M. tetragenus* was found in large numbers in one blood culture at the end of the third week. He was discharged from the hospital thirteen weeks after onset of appendicitis, improved for a few weeks, but died in exhaustion, almost exactly 6 months after the onset.

Treatment in this case was of little avail, though transfusions, drugs, chemicals and dyes at times seemed to help some. A study of the literature indicates that greatest benefit has come from the use of autogenous vaccine.

Because of the rarity of the condition, it is no doubt frequently overlooked, but it carries a mortality of approximately 50 per cent. This case is therefore reported as a reminder of the possibilities of *micrococcus tetragenus* infection as a surgical complication.

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SURGICAL JUDGMENT

No longer the primitive trade of the barber surgeons, our art today stands on a foundation of many sciences; the cornerstone of this foundation is surgical judgment.

The responsibility of the surgeon is great. He is the court of last resort and from his decisions there is no appeal. He must be prepared to meet any situation that may arise. Mr. Kipling aptly said in an address before the Royal College of Surgeons,

> Your dread art demands the instant impersonal vision which in one breath, one beat of the pulse, can automatically dismiss every preconceived idea and impression and as automatically recognize, accept and overcome whatever new and unsuspected menace may have slid into light beneath your steadfast hand.

In order that this may be true, the surgeon must be an individualist to a large extent. He must be possessed of a logical mind, capable of quickly mobilizing his mental powers to meet any situation that may arise. There can be no division of responsibility. He may take counsel, but it is the surgeon who must make the final decision and accept the responsibility for his decision.

Holding, as he does, the power of life and death and the future welfare of his patient in his hands, one cannot be too insistent that the surgeon develop to the highest point of efficiency this important attribute—surgical judgment.

Surgical judgment requires knowledge gained by experience in the practice of surgery and the ability to temper this knowledge with the principles of the fundamental medical sciences.

I sometimes wonder if in our enthusiasm we have not magnified technic too much. I well remember the statement attributed to Dr. Warren Stone of New Orleans, a great southern surgeon and teacher of surgery,

I can take any butcher out of a butcher shop, and in a few months teach him surgical technique, so that he can do most of the surgical operations as well as a recent graduate in medicine. He will not know when to operate or what operation to do: he can only do the operation he is told to do. He will be a surgical technician, but by no stretch of imagination a surgeon.

While technic is most important other qualifications are necessary to justify the right to practice major surgery.

The competent surgeon must combine the imaginative faculty of the artist with the analytic mind of the scientist. He must be capable of visualizing the patient from a vantage point that will bring into view the entire field of medicine. He must be first a good internist. And he must have a good working knowledge of psychiatry. This subject is I believe of increasing importance in these days, on account of the large number of neurotics who are candidates for surgical treatment. Good surgical judgment would not subject such patients to the strain of an operation that is not absolutely necessary.

As we travel down the surgical highway, we cannot help being impressed by the large number of surgical wrecks that line the highway. All of you have seen them.

A large class of cases to be found among the surgical wrecks consists of women who have undergone needless radical operations on the pelvic organs. There is no sadder commentary on the lack of surgical judgment than these nervous unhappy young women who have been needlessly unsexed by a surgeon who lacked surgical judgment.

One cannot but wonder why. There is but one answer—lack of surgical judgment. It is true, we are all human and therefore not infallible. Our surgical judgment is not always correct, but the number of surgical wrecks is too large to be accounted for by an occasional lapse of judgment.

Surgery is brought into disrepute among the laity whenever a surgical wreck is produced. We must not lay the flattering unction to our souls that the laity does not recognize these surgical wrecks. They are fully aware of them, and in their ignorance they blame surgery, not the individual operator. We may then ask the question, how can surgical judgment be developed? The answer is by better training of our young surgeons.

Good surgical judgment cannot be formulated by viewing the patient only through the narrow perspective of a specialty: it must be based on broader principles. In our zeal for improvement in the care of the sick, we may perhaps create too many specialties. While some subdivision is a necessity, we should be careful that the creation of surgical specialties is not carried to excess. The creation of too many tends to make the surgeon dependent on other specialists and the internist for a solution of his problems. He then becomes a technician rather than a surgeon. It is the duty of surgical organizations to combat the tendency for, if it is not checked, it will relegate surgery back to its status in the days of the barber surgeons.

Some may feel that it is not necessary to bring a subject of this kind before an organization of surgeons, because men most lacking in surgical judgment do not seek membership in such organizations. However it is time that we recognize that a large percentage of the surgery being done in this country is done by just such men.

Too many operators are neither mentally nor morally prepared to undertake the great responsibility of a surgeon and they are doing too many needless operations.

The unsuspecting public willingly submits to what amounts to mayhem because it thinks that the possession of the M. D. degree is prima facie evidence of ability to practice surgery in a capable manner; surgical training or the lack of it plays no part in the layman's selection of his surgeon.

In this materialistic age there is danger that the high ideals of our profession may be lost in the mad scramble for existence in a crowded profession. The high ideals of our code of ethics were in the past handed down from one generation to the succeeding one largely through the medium of the preceptor system. Now the young doctor too often enters the practice of his profession ignorant of the principles that should govern the physician or surgeon in his relationship to the public or to his fellow practitioners of the healing art. A knowledge of ethics would be a valuable aid in formulating a correct surgical judgment.

We should plan a better system of training the young practitioner who desires to practice major surgery. He should first be well trained as an internist before he begins his special training for a surgical career, and this training should include a long apprenticeship to a surgeon of recognized ability.

Our surgical organizations can by a system of education among the laity teach the importance of men thoroughly trained in the art of surgery.

The license to practice medicine should not confer the right to do major surgery. We should endeavor to obtain the necessary legislation in the States to require a special examination in surgery as a requisite for a license to practice major surgery.

May we visualize the surgeon of the future as a man possessing a well rounded education in the liberal arts, with some attention to logic and philosophy, before entering upon the study of medicine, an evenly balanced medical education, so that he may view the medical field as a whole; then a thorough postgraduate training in surgery.

May this surgeon be of such strength of character that he will fulfill the requirements of the famous oath of Maimonides—

Thy eternal Providence has appointed me to watch over the life and health of Thy creatures. May the love for my Art actuate me at all times. May neither avarice nor miserliness, nor the thirst for glory, or for a great reputation engage my mind, for the enemies of Truth and Philanthropy could easily deceive me and make me forgetful of my lofty aim of doing good to Thy children.

May I never see in the patient anything but a fellow creature in pain. Grant me strength, time and opportunity always to correct what I have acquired, always to extend its domain, for knowledge is immense and the Spirit of man can extend infinitely to enrich itself daily with new requirements. Today, he can discover his errors of yesterday, and tomorrow he may obtain a new light on what he thinks himself sure of today.

Equipped with a well balanced education in his profession, and fulfilling the principles outlined in the oath of Maimonides, the surgeon can formulate as accurately as is humanly possible, that great principle of surgery—surgical judgment.

J. W. D. Dicks, M. D.

BOOK REVIEWS

PEDIATRIC UROLOGY. By MEREDITH F. CAMPBELL, M. S., M. D., F. A. C. S., Professor of Urology, New York University College of Medicine, and Associate Attending Urologist, Bellevue Hospital, Consulting Urologist to the Mountainside Hospital, Montclair, N. J., etc. Formerly Professor of Urology, New York Polyclinic Medical School and Hospital, and Attending Urologist to the Babies, Polyclinic, New York Nursery and Child's, Lincoln, and Broad Street Hospitals, etc. With a Section on Bright's Disease in Infancy and Childhood by JOHN D. LYTTLE, A. B., M. D., Assistant Professor of Diseases of Children, College of Physicians and Surgeons, Columbia University; Assistant Visiting Physician, Babies and Willard Parker Hospitals, etc. In two volumes. 1,116 pages, with 1,350 illustrations on 610 figures and two colored plates. Price, $15. New York: The Macmillan Company, 1937.

It is a pleasure to pick up books as beautifully gotten up as these two volumes on Pediatric Urology, even though one may not at first realize that there is a justification for two tomes devoted to this refined specialty. However, on studying the work one is quickly convinced that urology in children, while probably not a large enough field to warrant a great many men devoting themselves exclusively to it, is a field in which a great deal of work is to be done. It is particularly striking to find that though many cases have been reported, there has been little systematic collection and classification of these cases and it has therefore been hard to derive general principles.

"A rapidly increasing interest in the clinical problems of urology in the young and the comparatively recent development of miniature cystoscopes have been mutually stimulative. About half of all children suffer some form of urologic disturbance before they reach puberty . . . The burden of this volume is to indicate to practitioners in general and to urologists in particular the clinical aspects of urologic disease in infants and children . . . It is hoped that these pages will help to make medical advisers of the young more urologic minded and that in turn urologists will see their young patients, in part at least, through the eyes of the pediatrists."

The first chapter opens with the famous quotation from Holt, "It is not so much that diseases in early life are peculiar as that the patients themselves are peculiar." The first chapter deals with methods of examination and diagnosis. The author emphasizes the importance of the history in children and particularly that in older children the patient himself should be interviewed privately in addition to the history from the parent. He also emphasizes the importance of a general study.

The second chapter is devoted to the importance of urinary obstruction. The third takes up the anatomy, physiology, embryology and anomalies of the urogenital tract.

He divides infections of the urinary tract into those that are tuberculous in origin, those that are gonorrheal (these of course are rare in comparison with cases seen in adult urology, yet rather appallingly common at that) and those that are neither.

The second volume opens with an admirable chapter on Bright's disease. Genital disease, urogenital injuries and calculus disease are taken up in turn. The chapter on tumors is superb. The greater part of this section is naturally devoted to the tumor that goes by the name of Wilms and yet one would be surprised to find how many other tumors do occur in pediatric urology. A chapter is devoted to neuromuscular disease. In spite of the fact that tabes is rare in children, this section on neurogenic disturbances of the genito-urinary system is the most complete the reviewer is familiar with.

The discussion of enuresis is a classic. Dr. Campbell never loses sight of the fact that this disturbance is often on a functional basis and he emphasizes that such children should always be treated first with this in view. Of those that were not benefited by psychotherapy for two months or so it is astounding to find that more than half exhibited definite lesions of the urogenital tract which stood in need of correction and that the correction of these conditions relieved enuresis in a very high percentage.

The last chapter is devoted to urosurgery. This consists largely of illustrations of operations that have been devised for the relief of congenital anomalies. Many of these are the work of Hugh Young.

Dr. Campbell writes with enthusiasm, clarity and precision. The reviewer would like to make his acquaintance. It is gratifying to see him speak of a "spontaneous fracture" (for *all* fractures are pathologic). The reviewer wishes that he had said "perinephric" (or possibly "perirenal") instead of "perinephritic." The book is so exquisitely gotten up that only one typographical error was noted.

Dr. Campbell has had an enormous number of pediatric beds in the large hospitals of New York from which to select his cases and one doubts if any other urologist will have the opportunity to study a larger number of urologic cases in infants and children. He has also drawn from his experience in private practice. This means that most of the illustrations are original, a fact which adds a freshness to the work.

SURGICAL TREATMENT. A PRACTICAL TREATISE ON THE THERAPY OF SURGICAL DISEASES. By JAMES PETER WARBASSE, M. D., F. A. C. S., Special Lecturer in the Long Island Medical College, Formerly Attending Surgeon to the Methodist Episcopal and the Wyckoff Heights Hospital, Brooklyn, New York, and CALVIN MASON SMYTH, JR., B. S., M. D., F. A. C. S., Assistant Professor of Surgery in the University of Pennsylvania Graduate School of Medicine, Surgeon-in-Chief to the Methodist Episcopal Hospital, Philadelphia, Pa., Visiting Surgeon to the Abington Memorial Hospital, Abington, Pa. 2,486 pages. In three volumes with 2,486 illustrations on 2,237 figures, some in colors. Second edition, thoroughly revised and reset. Price, $35. Philadelphia and London: W. B. Saunders Company, 1937.

The success of the first edition of Dr. Warbasse's Surgical Treatment was ample evidence that there was need for such a work. After eighteen years it was fitting that a second edition should appear. In this second edition he has wisely associated with himself a younger man. The authors insist throughout that the surgeon must be primarily a physician and a gentleman: surgical technic, important though it is that it should be of the best, is not enough.

The first volume opens with an exposition of the general principles of surgery. Anesthesia including the most recent intravenous anesthetics are well

presented. Syphilis, tuberculosis and other infections, nutritive disorders and the endocrinopathies are also covered adequately.

Throughout the book there is great emphasis on the preoperative and postoperative treatment of the patient. The discussion of the Wangensteen method of decompression of the stomach is admirable, particularly the emphasis laid upon frequent determinations of blood chlorides: if the reviewer had been thoroughly familiar with this section some months ago one of his patients might have survived.

The discussion of fractures is good. The authors object strenuously to the use of metal plates. It seems that they have not been entirely converted to the recent ideas as to getting a patient with fracture of the hip up in a few days. The general trend in this section is conservative, but sound.

The question arises why in a book on surgical treatment the authors talk about such things as psoriasis.

The second volume opens with a discussion of cranial injuries. Of course in this day of automobile wrecks it is important for every surgeon no matter where he works to know how to handle such accidents. However, it does not seem necessary in such a work to take up brain tumors and this reviewer for one objects vehemently to placing the treatment of cerebral apoplexy in the domain of surgery.

It is astounding to see that the authorities cited on laryngectomy are those who have not written on the subject for the last 20 years: this section has not been brought up to date. The authors note that bronchoscopy is of the greatest value, but that the technic is so fine that it is not suitable for the general surgeon or even for the general laryngologist. This makes it even more surprising that they should take up such conditions as brain tumors and cataract.

There is a good standard chapter on surgery of the thyroid. Even here exception must be taken to the paragraph on total thyroidectomy for the relief of congestive heart failure, which seems to be quite out of fashion now, while there is no note that it is sometimes done for angina.

The surgical treatment of pulmonary tuberculosis is A-1 except that Jacobaeus' method of severing pleural adhesions is ignored. The authors cite but one successful resection of the lung for carcinoma.

They list one successful cardiolysis and dismiss the subject in 3 lines. Beck's cardiorrhapy for the treatment of angina is not mentioned. Wounds of the heart though are well covered. It is surprising to see the blind passage of an esophageal bougie serially illustrated (even though there is a line in the text condemning the procedure).

Thirty pages with excellent illustrations are devoted to carcinoma of the breast.

The section on the abdomen is satisfactory. The discussion of peritonitis is fine. The discussion of ulcer is equally good. This large section would alone justify the work. There are splendid pictures and many excellent maxims. Short shrift is given the recent plan of feeding patients suffering from recent gastric hemorrhage or operation. Again attention must be drawn to the fine discussion of the general principles of abdominal surgery and of the excellent discussion of preoperative and postoperative treatment.

It is astounding that in the year 1937 A. D. the authors devote space to the question of splenectomy in the treatment of pernicious anemia: they do not betray that they have ever heard of splenectomy for purpura hemorrhagica.

There is no mention of sympathectomy in the discussion of Hirschsprung's disease nor of the work that has been done along similar lines in the treatment of essential hypertension.

The third volume opens with hernia. The illustrations again are first class and the authors are up to date enough to mention that the injection treatment has recently been revived with apparently encouraging results.

The chapter on the rectum and anus on the whole is satisfactory but there is no mention of the injection treatment of hemorrhoids. Syphilis in the authors' opinion is still the most common cause of rectal stricture: lymphogranuloma inguinale is conspicuously absent.

They realize that the time has not yet come when the treatment of diseases of the appendix may be rapidly dismissed. The discussions of treatment of diseases of the biliary system is also good.

The genito-urinary organs are covered in more than 200 pages and it seems that they are covered very well indeed. Gynecology, well illustrated and well discussed, appears to be complete. Surgery of the limbs and amputations are presented in detail. Plastic surgery also receives a long chapter. Electricity and irradiation and surgical treatment are in outline only. There is a valuable chapter on first aid and another on bandaging. The work winds up with a chapter on the "Economic and Social Aspects of Surgical Treatment" which is interesting and stimulating.

In short, this three-volume work contains an excellent discussion of the fundamental principles of surgery and of surgical technic and an admirable exposition of preoperative and postoperative treatment. It is so bountifully and clearly illustrated that it makes most operations appear simple. Its shortcomings are that there are exceedingly few references and where authorities are cited the year of the opinions quoted usually is not given. John Hunter pointed out 150 years ago that a surgeon has a right to change his mind with increasing experience. Its principal defect is that in most cases the surgeon is given inadequate grounds to select the type of operation best calculated to give desired results.

OBSTETRICS FOR NURSES. By JOSEPH B. DeLEE, A. M., M. D., Professor of Obstetrics and Gynecology, Emeritus, University of Chicago; Consultant in Obstetrics, Chicago Lying-in Hospital, etc., and MABEL C. CARMON, R. N., Chief Supervisor and Instructor in the Birthrooms, Chicago Lying-in Hospital and Dispensary. Eleventh edition. 659 pages. Price, $3. Philadelphia and London: W. B. Saunders Company, 1937.

The eleventh edition of this text for nurses, with chapters by a nurse and a pediatrician and, among other illustrations, reproductions of some of Dr. DeLee's famous movies, seems to be ideal. At the risk of appearing supererogatory however, one must particularly cite a priceless paragraph on "The Care of the Husband."